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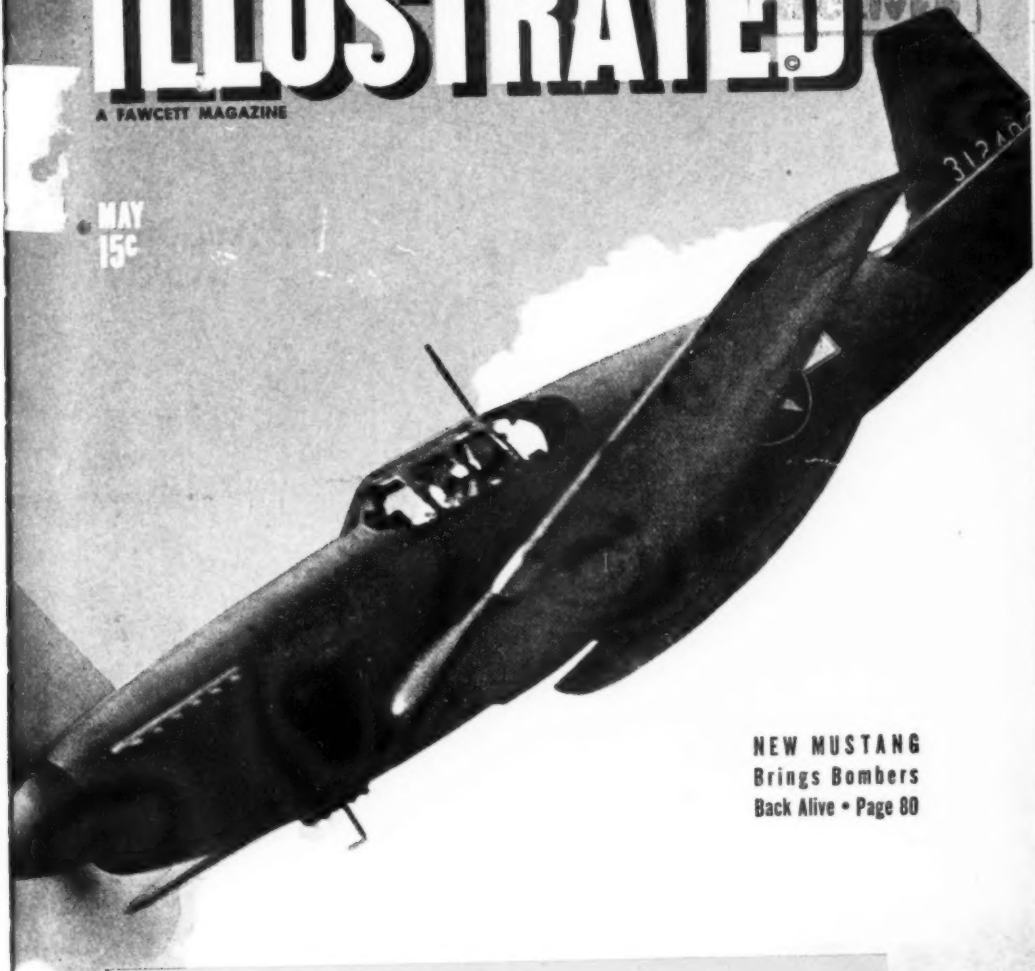


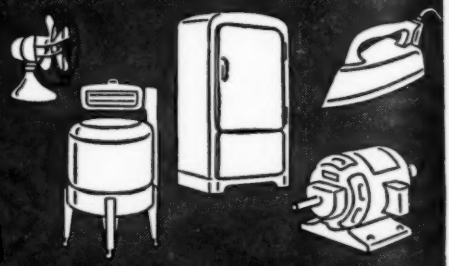
NEW MUSTANG
Brings Bombers
Back Alive • Page 80

MAGNETIC CURRENT
GREATEST DISCOVERY SINCE ELECTRICITY

FROM ENGLAND—THE REAL STORY OF
WING COMMANDER WHITTLE, THE MAN WHO INVENTED THE
JET PROPULSION PLANE

America's War Made Industry—

ELECTRICAL APPLIANCE REPAIRING



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NO EXPERIENCE NEEDED—New Course Tells All

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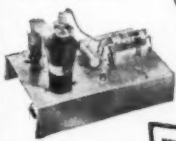

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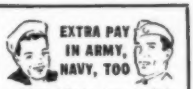

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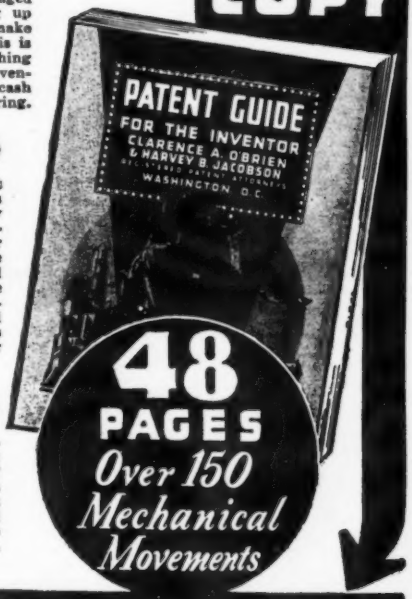

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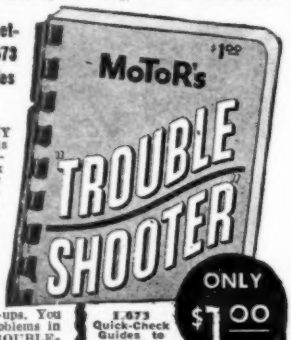

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- Pre-Ignition or Spark Knock (17)
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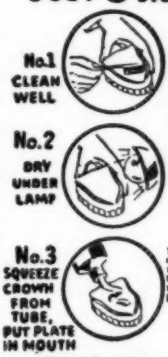

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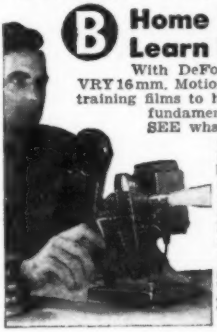

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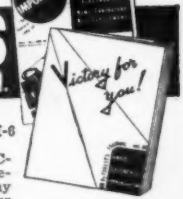

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YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Plastic Paper Clip

Wallace Paine, Rochester, Minn., submits a model of a paper clip made from plastic and wonders whether the idea has possibilities.

ANSWER: *Substituting one strategic material for another is not a good reason for an invention, particularly if the substitute is much more expensive than the material it replaces.*

There are many other objections to this plastic clip. It is entirely too bulky for use in files; it does not hold the paper as securely as a metal clip; it requires complicated machinery for forming and the clip soon would be replaced by the metal again when manufacture is resumed in the post war period. Furthermore, a die cut piece of flat sheet plastic would work quite as well and the manufacturing costs would be much lower. We advise against further procedure.

Manufacturing Problem

Herbert Chabysek, Houston, Texas, states that his friend invented a boiler alarm which operates on batteries or regular circuits and indicates when there is too much water in the boiler or the water is low. The mechanism also can be used to cut off the flow of oil or gas when the pump does not feed water. He wants to know where it can be made.

ANSWER: *You did not include the details of construction, consequently it would be difficult to advise whether you should try to get the unit manufactured in one plant or have semi-assemblies made for final assembly in a small shop of your own. Naturally, priorities would have a bearing on the number of these which you could manufacture, but if you can get governmental orders for them you should have no difficulty in getting the necessary clearance.*

Keyhole Saw

Daniel C. Laub, Minneapolis, Minn., submits a plan for a keyhole saw which does not require a drill for the starting cut. He states, "As yet, this saw is not being manufactured, pending being Patented." He wants to know if we consider it practical or not.

ANSWER: *The unique shape and arrangement of the teeth on this saw would make it appear to function as described. If this is so, then apparently you have designed a new tool. We would recommend that you have a patent search made immediately and if the search reveals patenting possibilities further action is indicated. We believe that you can develop a good market for this tool, even if you must have it manufactured or if you manufacture it yourself.*

Map Measure or Chartometer

Pvt. Maxson Sorensen, Lincoln Army Air Field, Lincoln, Neb., sends a design and an explanation of a new type of pocket instrument for measuring the distance between two points on maps and charts.

ANSWER: *In keeping with our policy we are not disclosing the details of your invention. We believe this instrument to be very much worth while and would recommend that you have a search made immediately. Pending the outcome of the search you should develop the mechanical features of this invention to a greater extent.*

First you should have a quick-zero reset. This can be taken care of by a split nut. Then, for much greater accuracy in reading, you can arrang for a vernier scale (something quite difficult with modern instruments). You can make the apparatus still more useful by employing a series of wheels each of which will be marked to a different scale. Thus you can get a direct reading instead of multiplying by a factor. The scale, of course, should register both in kilometers and miles. You may find it desirable to use a worm gear instead of bevel gears. This will permit the use of a coarser thread on the indicating mechanism and thereby increase life of the instrument. Don't forget a free area at the end of the scale to prevent damage. With these suggested improvements and with a freely turning sleeve to permit twisting the instrument around sharp bends in a road or river we are of the opinion that you will have the finest instrument of its kind available.

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CHIPS *from the* EDITOR'S WORKBENCH

FAWCETT AVIATION AWARD TO IGOR SIKORSKY

THE Fawcett Award, inaugurated this year trophy and $1000.00), is given annually to the person, persons or organization making the greatest scientific contribution to the advancement of aviation as a public service. In the picture above, Major Al Williams, famous flyer and aviation authority, presents the trophy to Mr. Sikorsky on the CBS network broadcast of "We, the People." Emcee Milo Boulton and Fawcett Publications' Treasurer, Gordon Fawcett, look on. The board of judges who chose Mr. Sikorsky's helicopter development as 1943's most significant aviation advance include Capt. Eddie Rickenbacker, Major Gill Robb Wilson and Casey Jones. Representing Fawcett Publications on the board were W. H. Fawcett, Jr., president, and the staff of Mechanix Illustrated.

Next Month

The June issue of MECHANIX ILLUSTRATED will contain many fascinating up-to-the-minute articles about the war and science, among them the following:

PAY-OFF AT KWAJALEIN: Eye witness account of a smashing American victory in the Marshall Islands by MI's South Pacific corresponding, Will Oursler.

WE'VE GOT 'EM COVERED: The real inside story of the fighter escort pattern that brings the Forts and Liberators safely home. For the *first time* details on the hitherto very secret subject have been cleared by military censorship. An able and exciting account by Arch Whitehouse. European war reporter for MI.

LIFE BEGINS AT 105! John Frank, journalist and science writer tells you about the miraculous healing serum discovered by the famous Russian doctor, A. A. Bogomoletz, who thinks it may enable man to live out his rightful span of 150 years

CRAFTS AND HOBBIES: Projects for the workshopper, modelmaker and home tinkerer, plus many hints and ideas for easing household tasks. There'll also be another article by Fred Russell on wartime car care, and a School Shop installment covering airplane engines. Don't miss your June MI!

THE CAN-DO BOYS

by E. H. Kelly

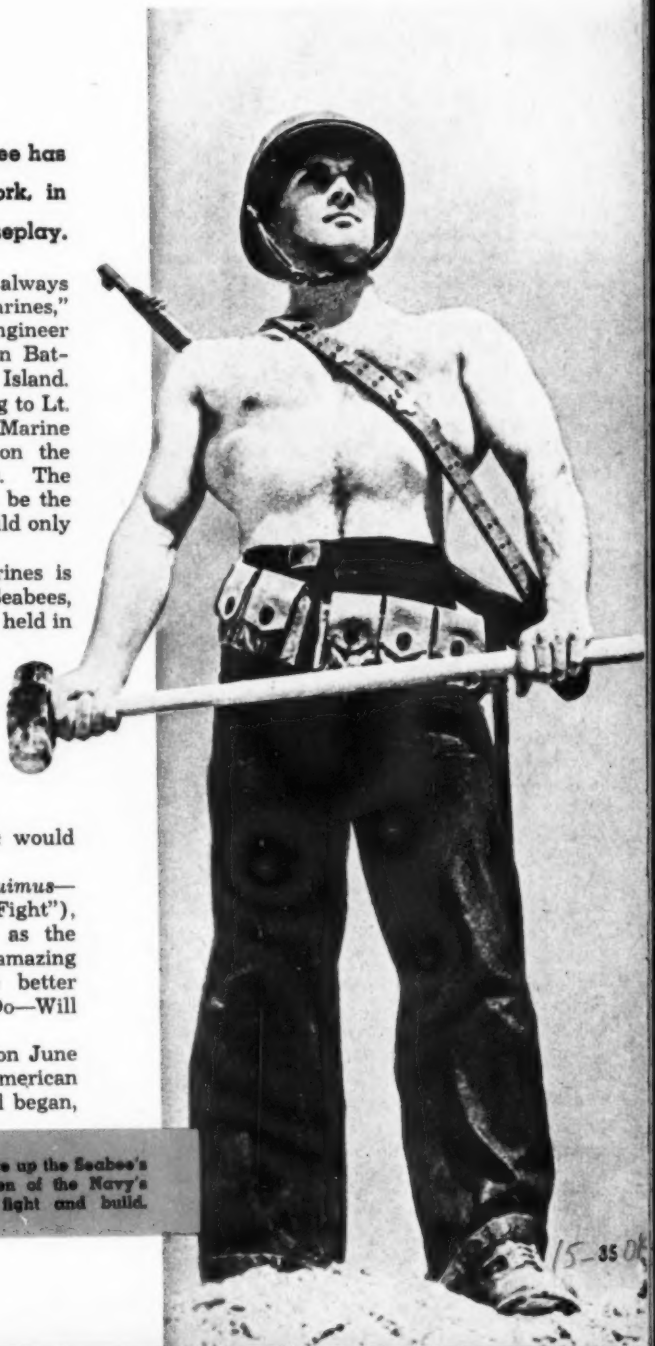
Ingenuity's one thing the Seabee has plenty of. It crops up at work, in battle—and in some nifty horseplay.

"COLONEL, the Seabees are always happy to welcome the Marines," said Lt. Bob Ryan, Civil Engineer Corps, USNR, of a Construction Battalion at Segi on New Georgia Island. He extended his hand in greeting to Lt. Col. Michael Currin of the Marine Raiders as the latter landed on the island to drive out the Japs. The astonished colonel, expecting to be the first American on the island, could only exclaim, "Well, I'll be .....!"

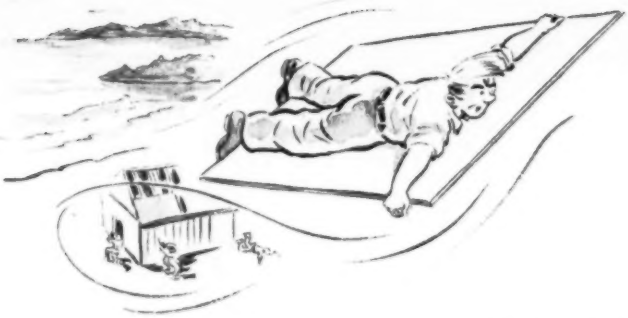
Getting in ahead of the Marines is only part of the reason why the Seabees, the Navy's fighting builders, are held in the warmest admiration and respect by the fightingest branch of the Services. The highest officers of the Army, the Navy, and the Marine Corps have testified that without the miraculous work of the Seabees the successful offensives in the South Pacific would have been impossible.

Their official motto is *Construimus—Batuimus* ("We Build—We Fight"), but they're popularly known as the "Can-Do" boys. As their amazing versatility and speed became better known, this changed to "Can Do—Will Do—Did."

At Segi the Seabees landed on June 30th of last year, the day the American invasion of New Georgia island began,



Rifles and sledge-hammers make up the Seabee's stock-in-trade. The miracle men of the Navy's Construction Battalions both fight and build.



"The pile-driver Williwaw struck so hard and so suddenly that it carried a sheet of asbestos, with one of them on it, to a hillside almost 150 feet away."

with bulldozers, power shovels, and trucks, and immediately built slit trenches for protection against Jap snipers and planes. Then they plunged into the work of building an airstrip 3,600 feet long. Despite the battle that raged all around them, they had the strip in usable condition by July 10th, and had finished it by the 12th.

"It wasn't a difficult job," said Commander John Lyles. "Just busting down 300 feet of jungle on the west end of the point, taking cocoanut trees off the rest, and filling in 800 feet of swamp in the middle."

This one instance of record-breaking accomplishment of a back-breaking job was duplicated on almost every one of the other South Pacific islands stormed by American forces. Guadalcanal, Tulagi, Munda, Tarawa —on each one the Seabees brought an airfield into being in a few days and made possible the consolidation of the American hold on the place. They also brought ashore supplies, built storage facilities, bivouacs, gun emplacements, and complete living quarters —and fought side by side with the fighting men to protect the beachhead from the enemy.

At Bougainville, the Seabees were again out in front. "If you guys don't hurry up and take this country, we'll have the field finished before you get there," they advised the Marines as they returned from surveying an airfield site well ahead of the American lines. They had been out on their own for days. Even when the airstrip was finally completed, Jap patrols were still close enough to take pot shots at the builders. Surveying parties and bulldozer operators were harassed by Jap snipers.

The Seabees hacked away for six weeks at dense, tenacious jungle to create Piva Field, second one built on Bougainville. Working against time to finish the 6,500 foot strip for light and medium bombers, they disregarded battle lines and constant enemy fire. At one point their road was 700 yards ahead of the combat troops' advance posts. When the field was dedicated on Christmas Day, they had the satisfaction of knowing that it brought the enemy base at Rabaul within 250 miles, and the great naval stronghold at Truk within 850.

Out on the South Pacific islands, ten thousand miles from the main source of supply, the Seabees have had to develop their ingenuity, with which they are generously endowed, to the highest degree. Every scrap of material is valuable because replacements can't be had at a neighborhood store. Wrecked equipment is gone over with a fine-tooth comb for salvageable parts. Everything is used—from bent nails, carefully collected and straightened, to wrecked ships, patched up with odds and ends from the Seabees' salvage piles.

But Seabee ingenuity sometimes goes too far. Listen to the sad tale of a Marine colonel. With a mental picture of himself sitting by his fireside, years from now, regaling friends and relatives with tales of What He Did in the Second World War, this colonel had gone

"Business began to boom so much that he changed the pawnshop's name to 'Vinck & Vinck, Inc.' because that sounded better, and upped his prices."

"A female Joe Louis but taller, hove into view in front of him with a smile on her face as broad as the Potomac. Benny and his pack rode ashore dry."

around collecting Jap souvenirs. Hearing of a particularly rare item at a certain Seabee camp which must be nameless, he hurried there and paid out $35 for a genuine Jap battle flag. No fool he, he examined the flag carefully to make sure it was genuine. The cloth and the lettering on it seemed to be the real thing. Having satisfied himself that he had obtained a bargain, he paraded it proudly before envious friends. Weeks later, he showed it to a couple of interpreters who read Japanese. After a first startled glance at the flag, they pounced upon it and examined the lettering carefully, muttering to themselves. Then they turned to the colonel and read to him what was written on the cloth: "Handle With Care"—"Fragile"—"Made in Yokahama"—and more of the same. The colonel's face turned into a creditable imitation of a fiery Oriental sunset. Investigation proved that the phrases had been copied from Jap packing cases which had been used in constructing a parachute loft. The colonel came to the painful conclusion that a defective 'chute had been converted into a flag and decorated with phrases copied from the wall of the loft. Mighty is the colonel's wrath, but he hasn't found that over-ingenious Seabee yet.

An example of Seabee ingenuity more worthily employed is the case of a couple of tank landing craft which had to be beached. The repair crew flooded the bows of the ships so that their sterns would rise out of the water, then attached cables from the ships to their versatile bulldozers on the beach and dragged the ships ashore, stern first. Faced with the problem of removing a damaged propeller from a crippled LST when they lacked the right equipment, the Seabees resorted to dynamite to get the propeller off its shaft. While the skipper of the ship covered his eyes and waited in agony, the Seabees packed the shaft with mud and then applied the dynamite. The propeller came off neatly on the first try and was carted off triumphantly to the island work shop for a complete overhauling.

The bulldozers are beasts of burden as versatile as their operators. The most famous case of the use of a bulldozer in a way the manufacturer had not dreamed of is that of Aurelio Tassone on Treasury Island, thirty miles from Bougainville. The Marines and Seabees were landing in the face of red hot Jap fire. One particular Jap machine gun nest on the beach was causing the landing craft Aurelio was on a lot of trouble. After trying to work under such opposition for some time, he had an inspiration. Raising the blade of his bulldozer, he charged down the ramp of the landing craft and up the beach straight at the spitting machine gun. He rode right over the nest, pancaking the occupants, then lowered his blade and filled in and smoothed over the hole. Enemy dead never were buried so quickly.

The Seabees haven't forgotten their business sense either. After all, most of them are considerably older than men in the other branches of the Services and have left good jobs at home to join the Construction [*Please turn to page* 154]

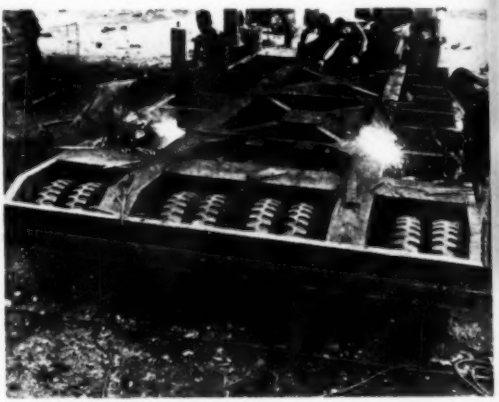
"The colonel's face turned into a creditable imitation of a fiery Oriental sunset. Mighty was the colonel's wrath, but he never found that Seabee."

A SEABEE "HONEY"

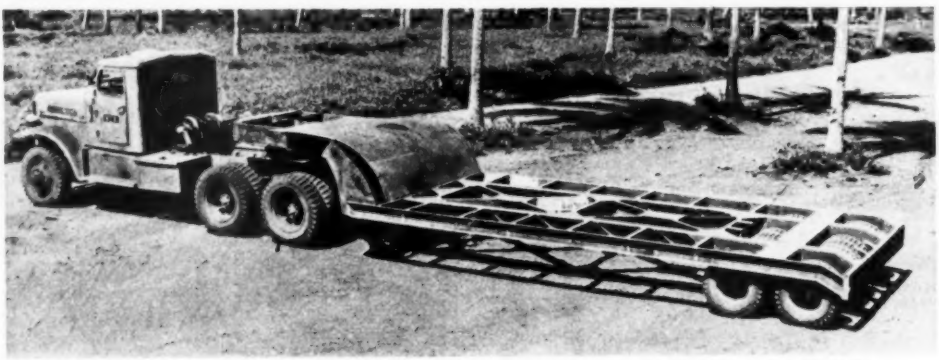
Twisted axles, battered wheel bases and armor plate were all these Seabees had for scrap. They're old hands at starting with nothing.

FROM junkpile to a 30-ton equipment trailer—that's how "Lowboy" was born. Beginning with piles of scrap obtained from junked battle tanks, these Seabees went to work with their blowtorches and welding irons. On last Christmas morning these construction wizards presented their office-in-charge with this sturdy equipment hauler. Not without reason are these grease monkeys called the Navy's Can-Do boys.

Outside of the tires, not one bit of new materials went into "Lowboy's" construction. Chief Machinist's Mate A. Vincent Spencer, extreme left, supervised the job.



Members of this Seabee battalion, old hands at welding and metal work, went to town on ideas for the trailer's construction, built their brainchild after hours.



And here's the finished product—"Lowboy" in person. The trailer is capable of transporting thirty tons of freight. With it much wear and tear on valuable equipment can be eliminated.

MAGNETIC CURRENT

Professor Felix Ehrenhaft in the modest New York laboratory where he made his discovery. Standing behind him is his sculptress-wife.

by Willy Ley

in an interview with Dr. Felix Ehrenhaft

Do you know that magnetism flows? Here's the first full story on this astounding discovery—the greatest since Michael Faraday's.

THE building at 485 Fifth Avenue in New York looks like thousands of other office buildings in the city. But it is a safe bet that after the war scientifically minded visitors will ask to be directed to Fifth Avenue and Forty-second Street and will stand on the steps of the Public Library, look across the Avenue and say: "So this is where the magnetic current was discovered."

This is where I, about eight weeks before you read this, saw a number of experiments run off for my benefit by Professor Felix Ehrenhaft. These experiments proved that there is such a thing as a "magnetic current."

Seeing them, I could not help but remember the time, some twenty years ago, another professor, a colleague of Dr. Ehrenhaft, cautioned me never to make the mistake of thinking of magnetism as a current. Electricity, he said, will "flow"; magnetism will not. An electric current passing through a wire, he stated, will create a magnetic field "wrapped around" the wire like a strip of tape. Would a magnetic current be accompanied by an electric field wrapped around the conductor? The professor forestalled that brain-twister by sternly declaring that "magnetism does not have any movement but only direction."

In the laboratory of Professor Ehrenhaft,

"I lost in Europe everything," Dr. Ehrenhaft tells Willy Ley, "but look now what in America I find."

located at the Carl Zeiss offices, I saw precisely those things I had been taught not to believe in. Peering through a microscope mounted in the center of a long table, I saw how tiny particles of metal acquired magnetic charges so that they became what Professor Ehrenhaft calls "magnetic ions," the counterpart of tiny electrically charged particles known as ions.

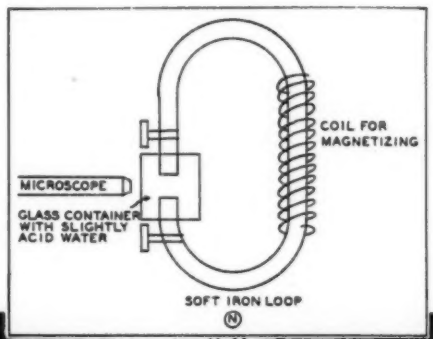
I saw thousands of minute bubbles of gas, carrying electric charges, swirl around magnetic poles, indicating that there was a magnetic current between them and that this current was accompanied by an electric field.

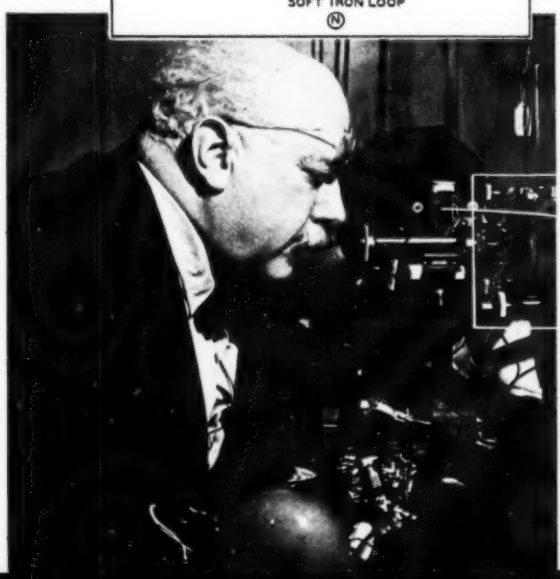
And I saw the experiment which makes the analogy complete.

An electric current, as everybody knows, decomposes water into the two elements of which it consists, hydrogen and oxygen. When the experiment is demonstrated in a schoolroom a small amount of sulphuric acid is usually added to the water. The physicist usually states that the small amount of acid is needed to make the water a conductor for the electric current. Then, two or three classes later, he explains that the reaction is somewhat more complicated. The acid, he says, is H_2SO_4, diluted with ordinary (distilled) water, H_2O.

The current, according to the chemist, does not attack the water directly. Instead it attacks the sulphuric acid, breaking down the acid H_2SO_4 into H_2 and O, hydrogen and oxygen, leaving SO_3, the tri-oxide of sulphur. Since the whole process takes place under water the SO_3 does not remain SO_3 but at once combines with the water, the H_2O, to form sulphuric acid or H_2SO_4 again. The new acid is, of course, attacked again and breaks down into hydrogen and oxygen and SO_3, then the SO_3 forms acid again and so on until all the water has been used up. The final result is that the water has been decomposed by means of an electric current, even though it had to go through a chemical compound first.

Now if there are "magnetic ions" just as there are electric ions, and if there is a





Here's the simple apparatus in which the professor made his discovery. The poles of a magnet are visible through the microscope, as the line drawing indicates.

Here you can see the movement of electrically charged gas bubbles, moving in the horizontal plane around the vertical magnetic field. One magnetic charge can be seen on the left side.

Electrically charged bubbles visible here are moving horizontally around the field. This time two distinct magnetic discharges can be seen. Such phenomena prove a current exists.

magnetic "flow" or current which carries with it an electric field in the same manner as an electric current carries a magnetic field—if, in other words, magnetism behaves like electricity in two respects it is logical to expect that it will behave like electricity also in the additional respect that it decomposes water.

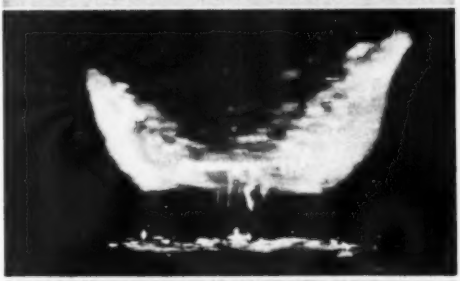
Professor Ehrenhaft tried it.

He used distilled water to which one per cent, by volume, of sulphuric acid was added. The two ends of an interrupted loop of pure soft Swedish iron were inserted into the liquid. Bubbles began to form at once, but that is simply a chemical reaction. When pieces of iron are thrown into a weak acid hydrogen gas is generated every time; in fact, this is one of the simplest ways of obtaining small quantities of hydrogen gas.

But then the iron was magnetized and the bubbles that formed at the poles of the magnet were collected and analyzed by expert chemists. The chemists found a considerable percentage of oxygen gas in the hydrogen, varying from two to twelve per cent of the total. The magnetic current had decomposed water—presumably in the same roundabout manner in which electric current decomposes it—forming hydrogen and oxygen. The collected gases contained a smaller percentage of oxygen than electrolysis produces simply because a chemical production of hydrogen gas had been going on at the same time.

Now this experiment had been made with an electro-magnet for the sake of convenience and one might still have argued that somehow electricity [*Continued on page* 144]

Two ends of a soft-iron horseshoe magnet are dipped into water containing sulphuric acid. Result: pure hydrogen is generated. Rising bubbles, visible here, are produced this way.



Constant electric current represented by charged bubbles moving around a constant magnetic field. One polar magnetic discharge moving against buoyancy can be detected now.

Magnetic currents decompose water. When the magnet is placed in the water, a mixture of hydrogen and oxygen gases is generated, and the strength of the magnet is slowly sapped.

AN ADVENTURE IN

by Commander Attilio Gatti

Ever see an okapi? It's the nearest thing to a fossil walking and camera-shy. Comm. Gatti spent a solid year taking its picture.

DO YOU know anything about photographing an okapi in the depths of the Belgian Congo's equatorial jungle?

Well, neither did I—not until well after I left America for my eighth African expedition. As for the fact that, despite hundreds of persistent attempts, no one had hitherto managed to photograph a live okapi—why, that was just the point.

That was exactly what I had organized my expedition for. I had even built several contraptions of my own to click pictures by remote control, to have animals automatically snap shots of themselves by tripping on strings, to have flares ignited at the same time so that there would be sufficient light, jungle or no jungle.

I already knew the jungle was a primordial world of colossal trees, monstrous dead trunks, barbed bushes, matted lianas, thorny creepers, all balled up in unbelievable entanglements—smothered by a high, almost uninterrupted dome of thick green foliage through which only stray rays of sun could pierce.

Once there, I would be faced by the yet unsolved riddle of how to approach this shyest of all jungle denizens, whose single-minded mania for solitude and privacy is backed by the most hyper-sensitive smell and hearing, as well as by a formidable strength.

You should have heard me describing the animal to my publishers. Legs striped with black and white like a zebra's. The cloven hoofs of an ox. The body of an antelope, but dark mahogany on the back, light red on the flanks, pure silver on the belly. The neck of a horse, only much longer. The head, the short horns, the slow-motion gallop of a giraffe. A tough, stiff black mane all along the spine, from between the enormous ears to the short bovine tail. Great blue eyes turning independently, like a chameleon's. And a two-foot blue tongue darting out like an anteater's.

"Think of it, man! A *living fossil* whose

To "shoot" the okapi, Comm. Gatti contrived a special cambra gun. Focusing was done by telescope, and a telephoto made up the big barrel.

skull is identical with that of the Samotherium which lived in prehistoric Crete some millions of years ago. A creature so rare that it escaped discovery until 1900; so elusive that it has never been captured alive or photographed in freedom by a single explorer. This is the animal I'm going to photograph for you—or bust."

Half a year later I had lost some thirty pounds. I had walked so much through that infernal jungle, I had the impression my legs were worn inches shorter. The balance of my anatomy, because of the millions of insect bites collected during eternities of exhausting march and even more exhausting ambush, looked like a sieve—and felt worse.

And my famous pictures?

Ha!

It wasn't as if okapis were so rare, after all. As soon as we penetrated beyond the limits usually reached by native hunters and pygmies, the darned beasts became so plentiful that every day we would find dozens of fresh tracks.

The trouble was getting near enough, when you, on one side, had to cut your way step by step, with machetes, and the animal, on the other, was forewarned of your approach minutes in advance by its huge, ever-alert ears.

The automatic devices proved just as helpful. You would fix them up across a path used twice by the same okapi—and scram, so as to leave behind as little scent as possible. The next day you would return—and, most of the time, new tracks would tell you that the animal had come back in the night, stopped abruptly just before the practically invisible strings, and turned about without touching them, evidently warned by what human scent clung to them.

Naturally, there were also other times when we could almost see Lady Luck fixing up to smile, almost to beam, upon us and our efforts. By staying immobile a whole night perched on the top of a tree bordering a clearing, or by discarding all dignity to crawl, like a worm, with every precaution of a Red Indian, sometimes we got some good shots. Or, by soaking the strings of the automatic cameras in vegetable juices, we managed to fool an okapi into photographing itself.

In such cases I would dash back to camp, shut myself in the doubly-thick black-lined tent I had had built for a dark room and, still

Here's what the shooting was all about—Gatti's elusive okapi in the flesh. These photographs are the first ever made of this jungle oddity.

Comm. Gatti knew it wouldn't be a snap to get the okapi's picture. The jungle was shadowy, the subject jittery. He had to haul along more special equipment than a hunter on safari.

panting, begin developing the films with the utmost care.

Then I would switch on the flashlight—and all I would see was a practically transparent piece of film, barely marred by some weak nebulosities that could indifferently be called: "Night of Fog at the New York Battery," or "Cloud Effects from within the Cumulus," or "The Stratosphere at 30,000 Feet."

Once more, the appalling lack of light, the general, overwhelming uniformity of green tones, plus the queer influence that the fantastic humidity exercised on the gelatine, had combined to deceive my eye as well as that of the meter—and to laugh into nothingness everything I had undergone for weeks and weeks.

By the end of the year, with my five cameras and eleven lenses, I had exposed exactly 2,421 negatives—isochrome, panchromatic, superpanchro, ultra-sensitive, specially sensitized plates, cut-films, film packs and roll-films. Of these, 1,585 were of animals, mostly okapis. Or, to be more precise, they were intended to be. Actually, only 23 showed a faint, misty shape that with a lot of good will one could recognize as the head or something of an okapi.

And what did I do with these sad, most negative of negatives? In despair, I set myself to reinforce half of them. Only the dampness had gone to work on the reinforcer, or whatever you call it. And what I finally got as recompense for this extra zeal was a reddish strip of celluloid peppered with bursting stars which looked like Fourth of July fireworks.

"I'll transform myself into a walking bush," I decided. "That's the only way I can ever approach an okapi while he is in a clearing, the only place where I can get sufficient light."

Quicker done than said. Next time a pygmy scout reported an animal standing in a clearing large enough to receive some direct sunlight, I put the plan into action. I motioned to the other pygmies to help me and they, cutting bunches of leafy branches in their silent fashion, began to tie them all around me.

I must have been a sight all right. However, the pygmies were gentlemen. And much too smart to let their astonished merriment burst out in loud laughter. They didn't even giggle, audibly, at least.

All their chief timidly whispered in my

ear, while fastening the last branches, was the word *bilulu*. That was the name of the biting ants which, if they can get at you, cover your body without your noticing anything, then, at some kind of short wave signal from their commander-in-chief, instantly sting you —everywhere, all at one time, with the most devastating effect.

My camouflage completed, my camera all set, off I went, silent as a shadow, gliding through the jungle without so much as a tiny rustle.

As soon as I detected the okapi, slowly, carefully, I went down on all fours. Each time the animal stopped feeding, showed the slightest nervousness, I froze in my tracks.

The pygmies having infallibly picked up the wind and set me straight against it, I succeeded in reaching a spot about 25 feet from the animal. Just the distance I had set on the lens. It was wonderful. The okapi was in a swell light, for once. Between him and me there wasn't a single liana or branch to obstruct the field. All I had to do was to straighten up, raise the camera, aim it, shoot.

Success, at very last, was mine.

I was mad with joy. To make it all absolutely perfect, just then the okapi casually turned his head, not toward me but in the opposite direction. So I didn't even have to move with the cautious slowness I had planned and which my strained muscles dreaded. Instead, I straightened up with one quick jerk—and in the same instant I understood what the pygmy chief had meant. The *bilulu* against which he had warned me were not on the ground. They were in the branches I had asked him to fasten around me quickly and with no back talk. Now, having had plenty of time to creep all over me and ambush themselves under my clothing, they had taken my brusk movement as a declaration of war. Without losing a second, they had all gone to town, plunging in my skin some ten million pairs of sharp pincers.

"There is a big okapi," the pygmy chief murmured one early afternoon in my ear.

Listening well, I could hear the animal splashing happily in the river. But, naturally, I could not see a thing, so thickly crammed with vegetation were the 50 feet or so seperating us from the stream.

"Hell!" I whispered, filled with excitement. "What are you waiting for? Send some of your hunters, quick, to drive the okapi toward us. I'll stay here with you, motionless. When the okapi comes into that bit of sunlight, there, you jump up to stop him a few moments. And I—click, click, click—take plenty of *photulas*. See?"

The pygmy chief grinned, showing a masterful array of sharply filed teeth. A few rustling noises such as a light breeze can awake among leaves, and he and his pygmies were no longer in sight.

While the [*Continued on page* 152]

Often the okapi hunt meant crawling wormlike through the brush, or spending nights perched in trees.

HORNETS OF DEATH

by Major Malcolm Wheeler-Nicholson

The tried-and-true machine gun isn't as spectacular as some weapons, but it packs a special sting in this war.

YOU can't fight a war without machine guns. True, in modern warfare you need a bewildering assortment of gun-toting planes and water craft, tanks, self-propelled artillery, flame-throwers and bazookas.

But all the more sensational weapons would be stymied without the staccato fire of these tried-and-true small automatic pieces. Their metallic hornets pack a special sting.

For example, follow through the troop-landing operations on the hostile shores of a South Pacific island.

First comes a withering bombardment from naval vessels offshore. Then bombers go to work razing the area, while fighter planes swoop down to blast enemy troops—the first use of machine guns in this engagement. Our fliers signal back the locations of Jap artillery and machine gun emplacements, which are then sought out and destroyed by naval gun fire.

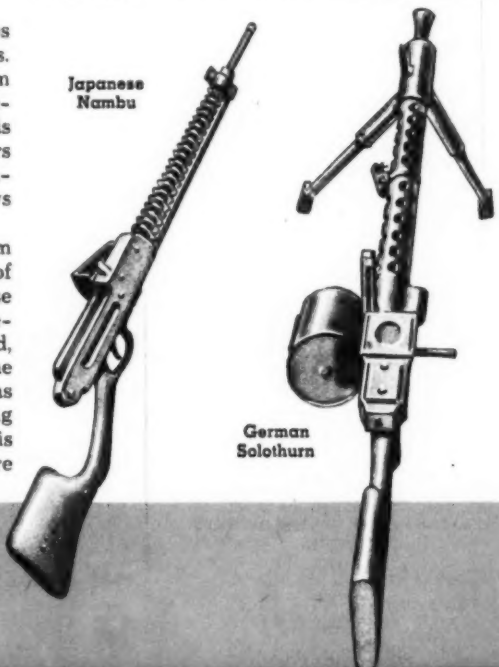
Enemy bombers are driven from the skies by the machine guns of our fighter planes. Once the way is cleared, landing craft swarm in to shore, packed with men crouching behind their bulwarks. Among these men is a heavy proportion of machine gunners carrying Tommy guns, carbines, and machine rifles. Heavy machine gun crews follow up.

Overhead machine gun fire spouts from the landing craft to cover the quick dash of assault troops up the beach. When these men are on dry land, the automatic riflemen and machine gunners hit the sand, scurrying for any cover they can spot. The harsh clatter of the machine guns begins immediately, every trained gunner picking the target nearest his front. Under this cloak of automatic fire the assault forces are able to close in with Tommy guns, hand grenades, and bayonets.

To get at targets buried in firing pits, mortar crews set up their deadly stove pipes and begin to loft high angle mortar fire down enemy necks. Meanwhile, individual sharpshooters are busy picking off individual Japs wherever they expose themselves.

As more waves of assault infantry land, the beachhead is enlarged. Light machine gunners then move forward with the assault troops, heavy machine guns are worked into position to enfilade the enemy from the flank. The steady crashing bursts of these machine guns mount into a continuous roar, rising above the intermittent smash of the 75 mm. and 105 mm. guns of the tanks now lumbering into action.

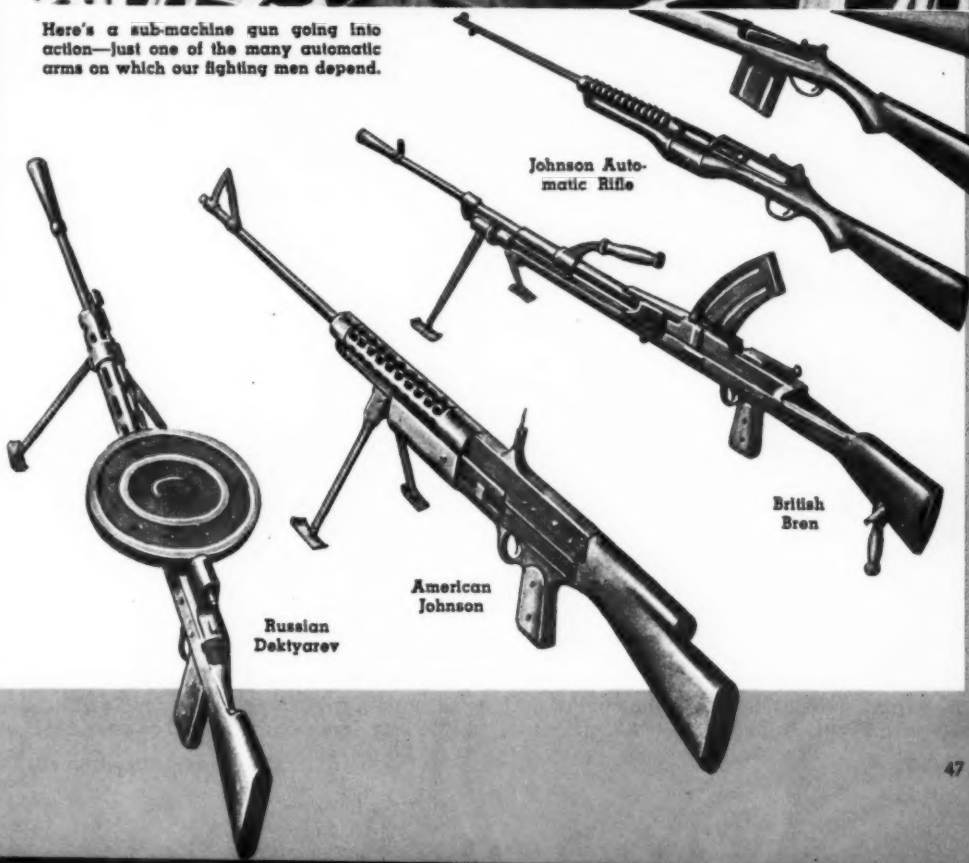
Hours pass. Along toward dusk the roar of battle dies down. All preliminary objectives have been gained and the initial beachhead area secured. Now remaining enemy

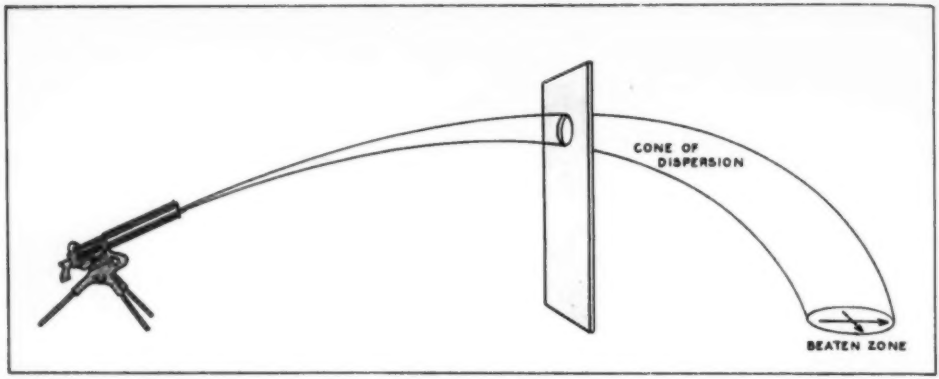


Japanese Nambu

German Solothurn

Here's a sub-machine gun going into action—just one of the many automatic arms on which our fighting men depend.





The bullets from a machine gun form an invisible sheaf, or bent cone, made up of their combined trajectories. This is called the "cone of dispersion." The base of this cone, the area inside which the bullets hit the ground, is the "beaten zone." Machine guns allow more concentrated fire than rifles, and cover an area more intensely.

pillboxes are being knocked out by tanks and flame throwers, while the engineers work like beavers getting the captured landing field into shape, smoothing out roads, putting up barbed wire obstacles against enemy counter attacks.

Far away, on the outermost line of outposts, the machine gunners are preparing emplacements. Taking advantage of the last vestiges of daylight, they lay out their fields of fire, set and lock their elevating and traversing mechanisms so that a touch on the trigger will send an accurate burst of fire over the proper area no matter how dark the night. As night comes on the heavy fire dies almost completely. The electric silence is punctured only by an occasional shot from some nervous sentry, or a short, vicious burst of fire from a machine gun—just to warn the enemy that our side is ready and waiting.

The machine gunners can now sink down for a few hours of sleep. They have good reason to feel elated. Without their barking weapons the operation might not have come off.

Despite its vulnerability, the machine gun has proved itself a deadly effective weapon. At the outbreak of World War I four machine guns were considered enough for a battalion —immediately prior to our entry into the present war we had stepped the number up to four machine guns per company and 30 per each infantry battalion. That's the most eloquent testimonial to the worthiness of this class of arms.

In the last war the machine gun had a paralyzing effect on military operations, immobilizing millions of men in the mud of the Western Front. It checkmated the offensive for nearly four years. Not until the final months of that long conflict did the offensive once again come into its own—and then only with the aid of the machine gun, this time carried behind armor, in tracked vehicles called tanks.

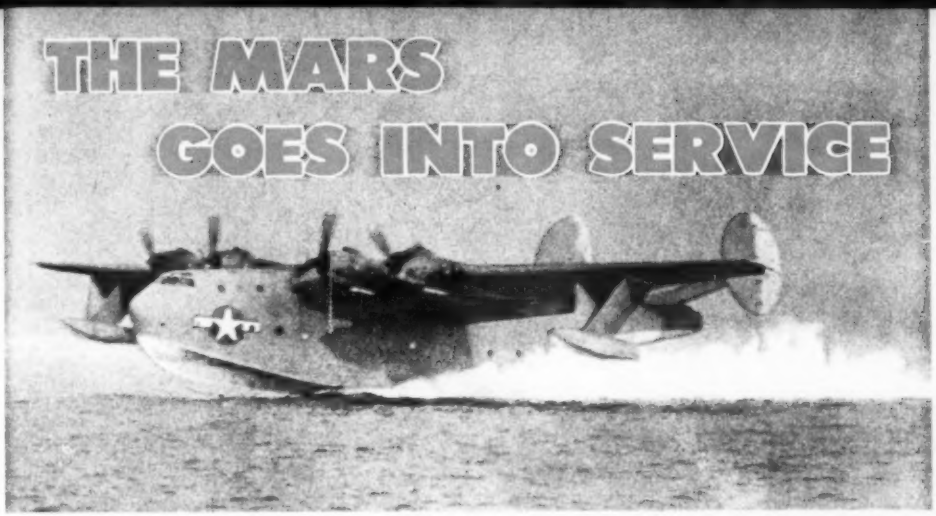
Today, from the mouths of mountain caves in Italy, behind log emplacements in Russian forests, and out of foxholes in New Guinea, the machine gun's nervous chatter is supplying the *leit motif* to the thunder of modern war. Its hornet-like messengers carry the sting of death on land, over water, and in the air.

The modern machine gun is a far cry from the ancient hand cannon, the wheel lock, the snap-haunce, the Miquelet lock and flintlock. Even more remote in time is the "Polybolos" constructed by Dionysius the Tyrant in Sicily, back in 400 B.C. But the latter weapon, which fired a succession of arrows fed by a magazine hopper, is a true forerunner of the contemporary weapon.

Today the Americans are far and away the leaders in the development and use of these automatic rapid-fire pieces. Our gun designers are working out new improvements for automatic arms every day. For example, there's the new type of American incendiary .50 caliber machine gun bullet, said by General "Hap" Arnold to be "the most devastating ever produced for aerial warfare." These bullets cause enemy planes to burst into flames on impact. Self sealing tanks are helpless before them. Armor plate that can resist them is too heavy for aircraft.

The modern machine gun really goes back to the 1820's, when for the first time a group of rifle barrels were [*Continued on page* 148]

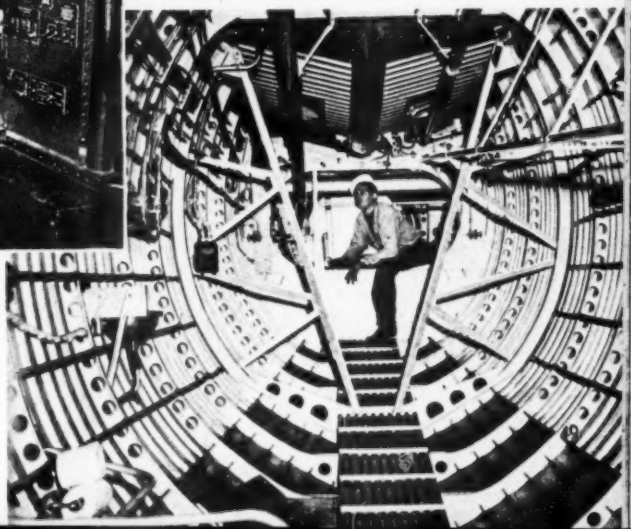
THE MARS GOES INTO SERVICE



WITH her four 2,200 h.p. Wright Cyclone 18 cylinder engines roaring, the largest airplane in use in the world takes off on her record breaking flight across the Pacific. She carried 148,500 lbs. from Alameda, Calif., to Pearl Harbor non-stop. She's twice as heavy as a Flying Fortress, is bigger than the average sailing vessel of 1798 in gross tonnage. Air transport is six times faster, 20 times safer than by ship.

Lt. Comm. William E. Cody (left), captain of the Mars, and co-pilot Lt. J. A. Baker sit at the controls before the start of the now famous Pacific flight.

The fantastically complicated engineer's panel of the Navy's huge flying boat, a gadget-man's nightmare.

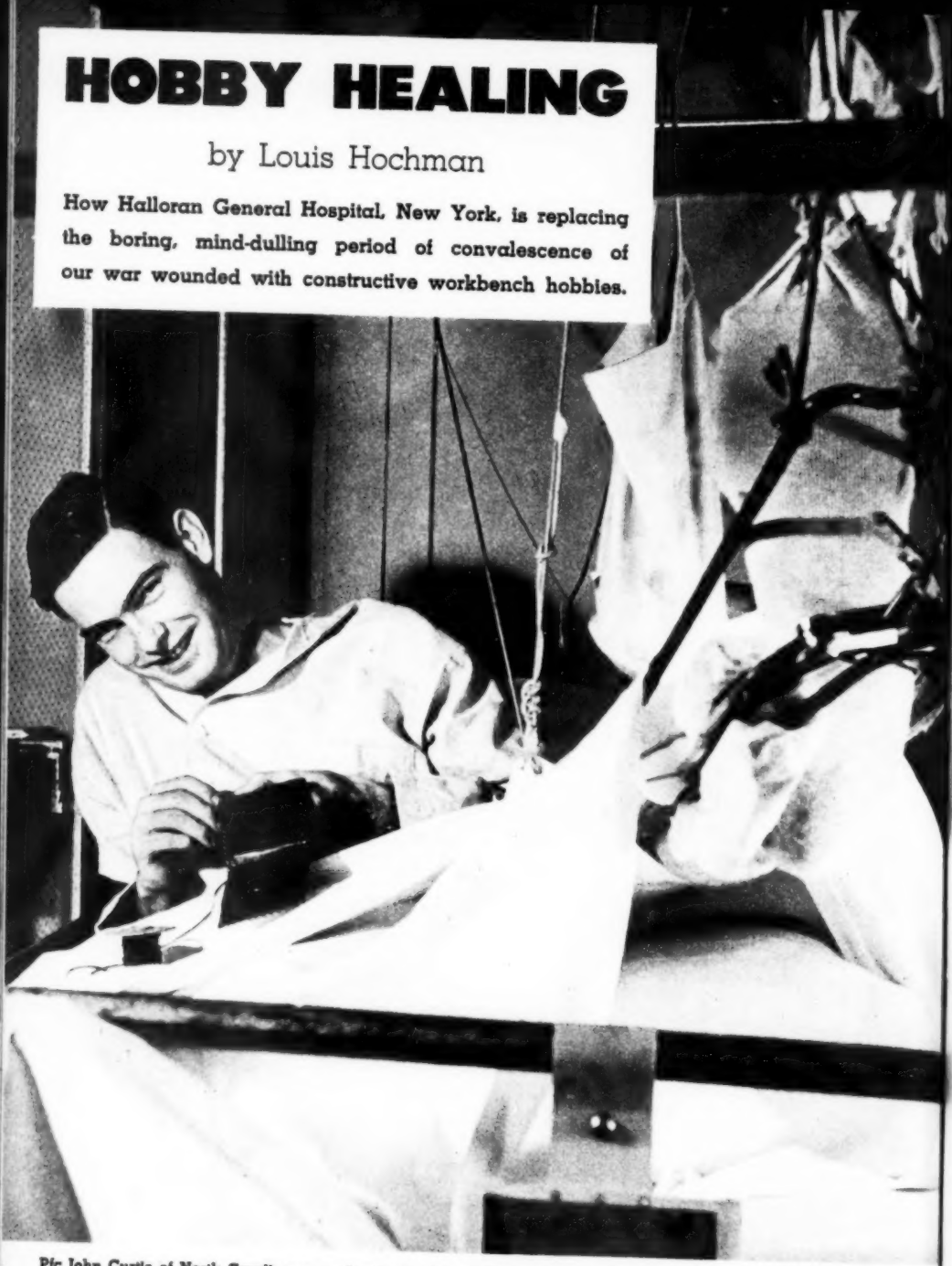


At right, like a spider in a web is this Navy man in a small section of the tail interior of the Martin-Mars.

HOBBY HEALING

by Louis Hochman

How Halloran General Hospital, New York, is replacing the boring, mind-dulling period of convalescence of our war wounded with constructive workbench hobbies.



Pfc John Curtis of North Carolina saw plenty of action in North Africa with the Medical Corps. He says he got his leg injury when his "jeep flew too low." While he waits for his leg to heal, he keeps his mind busy and his hands exercised making a handsome wallet. Pottery making, weaving, metal crafts help too.

IT HAPPENED in Sicily when our troops were counter-attacking into San Stefano. It was one of those jumping land mines—the kind that pops up into the air when set off and explodes a few feet from the ground, sending out a deadly spray of lead pellets the size of marbles. Sgt. Abraham Pekofsky of Brooklyn, N. Y., started to go down when he heard the mine go up, but he just didn't go down fast enough. He caught two of the pellets, one ripping into his right elbow, barely missing the bone. It did hit the nerve, however, and that put a finish to his fighting days for some time to come.

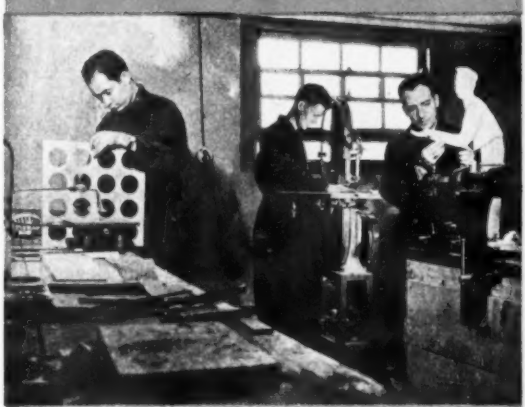
Today, as a convalescing patient in Halloran General Hospital, Abe is gradually regaining the use of his immobilized arm by exercising it in a very unusual, yet entertaining manner. He is spending several hours a day making such handicraft items as leather wallets, braided key and dog tag chains, decorative cigarette holders and ash trays, etc. It is all part of a new handicrafts reconditioning program designed to serve the double purpose of keeping the wounded soldiers mentally and physically occupied and, at the same time, mildly exercising the affected muscles of the body. The encouraging success of the program is reflected in the enthusiasm of the boys and the fact that it has done much toward hastening their recovery and materially shortening their periods of hospitalization.

An architectural engineer in civilian life, Private Siegel, an instructor in the reconditioning program, taught arts and crafts at the Universal School of Handicrafts at Rockefeller Center, where he had among his students many handicapped and disabled individuals.

To adapt this plan for the benefit of war wounded and other hospitalized soldiers, arts and crafts had to be simplified to a minimum of equipment to permit bed patients to engage in the activities right in the wards. Soldiers are taught how to make pottery without a kiln by using a powder called Plasti-carve, which when mixed with water becomes clay-like in consistency for modelling, and later dries

A few samples of pottery made by convalescing soldiers in the Red Cross workshop at the hospital. Hours for craft work there, from 1 to 5 P. M. daily.

Miss Sylvia Block, in charge of the workshop, helps Pvt Ernest Rogers with a weaving problem on the large loom. Weaving combines art and dexterity.



On a jig saw, band saw and lathe, three vets work on projects in the woodworking section of the Red Cross shop. The best of power tools are used here.

In the metal crafts shop, Pvt Phillip Kenny hammers out a copper ashtray. Handicrafts reconditioning program may turn out a Cellini.

Pfc William Fabricant (left) exercises his injured left hand making dishes of pottery compound. Sgt. Abraham Pekofsky unlimbers his injured right arm.

A Coney Island corporal, Jack Feigin, takes to art for pleasure and exercise of a wounded shoulder. A good painter, he prefers fishing.

to a stone-like hardness and can be painted in any color. Before this pottery was never permitted in hospital wards. Other craftswork which is adapted to ward work includes leather crafts, weaving, book-binding, braiding, modelling, etc.

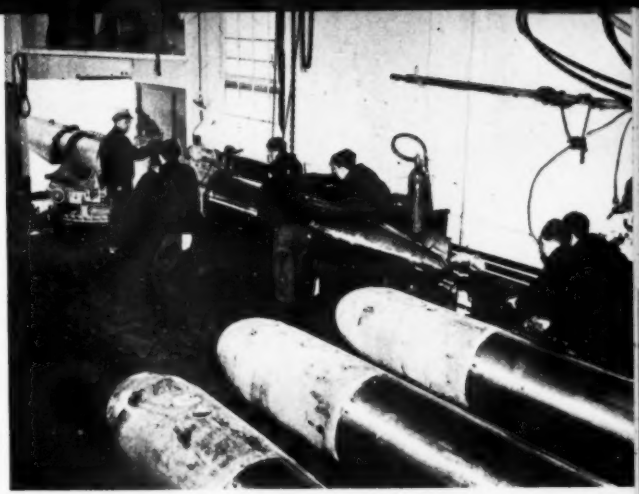
Medical officers prescribe what a patient should do, after considering the patient's injuries, what parts of his body require exercise, and what handicraft activity would best be suited to giving him this particular type of exercise. A patient whose legs are in casts will, through inactivity, lose the strength in his arms unless he exercises them frequently while in bed. To offset this, such bed-time crafts activities as embroidering, weaving artistic scarves, doing leatherwork, etc., is prescribed by the medical officers.

Squeezing a rubber ball, a practice usually prescribed to exercise an injured hand, will generally become very monotonous for the patient, but, given a leather wallet to make, where he is required to punch many holes through three thicknesses of leather with a hand punch, he gets the same exercise in a more pleasant manner. In the end, he has a greatly improved hand and a leather wallet to boot. Thus his curative exercises take the form of play, giving him mental as well as physical stimulus. To a great many patients who have never done craftswork before the program comes as a pleasant surprise when they discover how many unknown talents and dormant capabilities they possess. As a result, many of them develop interesting, lifetime hobbies.

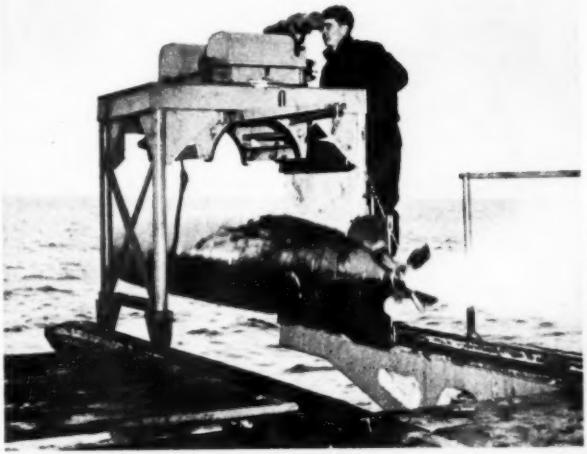
Patients can do all sorts of leather craftswork, bookbinding, sculpture, painting, weaving on small or large looms, embroidery, sewing, etc. [*Continued on page* 142]

TIN FISH TESTING

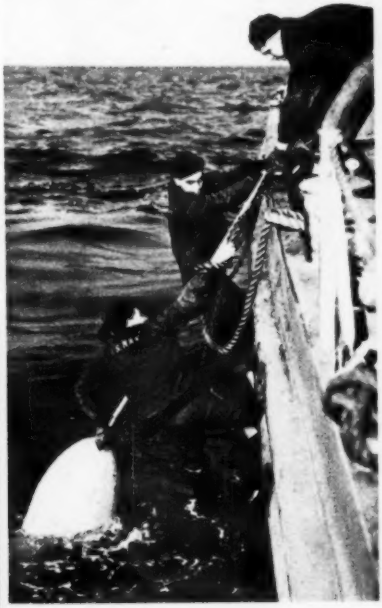
THAT fisherman's paradise, the waters off Montauk Point, New York, has a special kind of explosive, metallic swordfish cutting through its blue these days. A U. S. Naval Torpedo Testing Range is there. With water-filled heads the tin fish are fired, checked by radio-telephone along their courses.

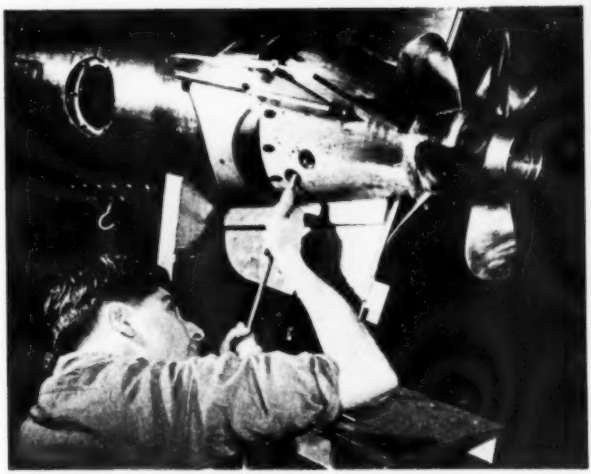


Torpedo tube loading on the special barge. As tin fish cost around $10,000 all are retrieved by boat or divers.



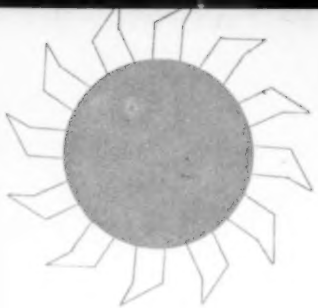
She's off! (Left) An aerial type. Water in head is ejected at end of run, "fish" become buoyant, surface.





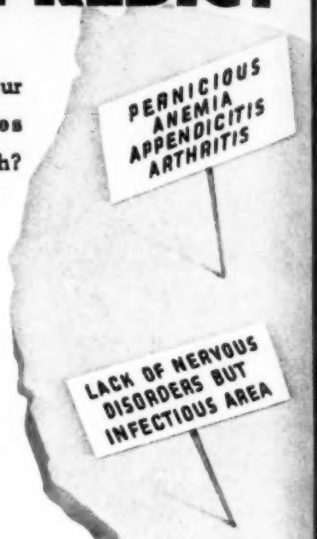
Bringing one back. If they do sink, divers get 'em. Now head is removed, "fish" goes back to overhaul shop.

In shop aft-body is dismantled. Torps are adjusted, refilled with alcohol, water, compressed air—tested again.



CYCLES PREDICT

How did cycles affect your birth and sex? What does weather do to your health? What about sunshine?



WEATHER cycles began to affect you long before you were born, and you carry their imprint throughout your life.

The fact that you are a man instead of a woman, or vice versa, is related in some measure to the kind of weather that prevailed nine months before your birth.

Similarly, weather conditions at time of conception had something to do with whether you were a chubby or a skinny baby—a short, broad one or a long, slender one.

And if you were lucky enough to be born in February or early March, your inheritance gives you an excellent statistical chance of living some three years longer than persons born in July or August.

Weather and climatic cycles even affect your susceptibility to certain diseases. If you live in a cool, stormy, stimulating climate, look out for pernicious anemia, ulcers of the stomach, high blood pressure, hardening of the arteries, diabetes, appendicitis, arthritis, toxic goiter and tuberculosis. On the other hand, if you live in a hot, relatively unchanging climate these ailments will not greatly threaten you, but you will be subject to infectious diseases to which the northerner is more resistant.

These statements are made without qualification (which of course they require) in order to win your consideration of scientific findings concerning the profound effects of weather and climatic cycles upon you—hence upon every other inhabitant of the globe and upon all manner of activities initiated by man including wars, business, social and governmental trends. It is not to be supposed that climatic cycles explain all these complex phenomena. Rather, climate is important because its tremendous influences are only beginning to be understood.

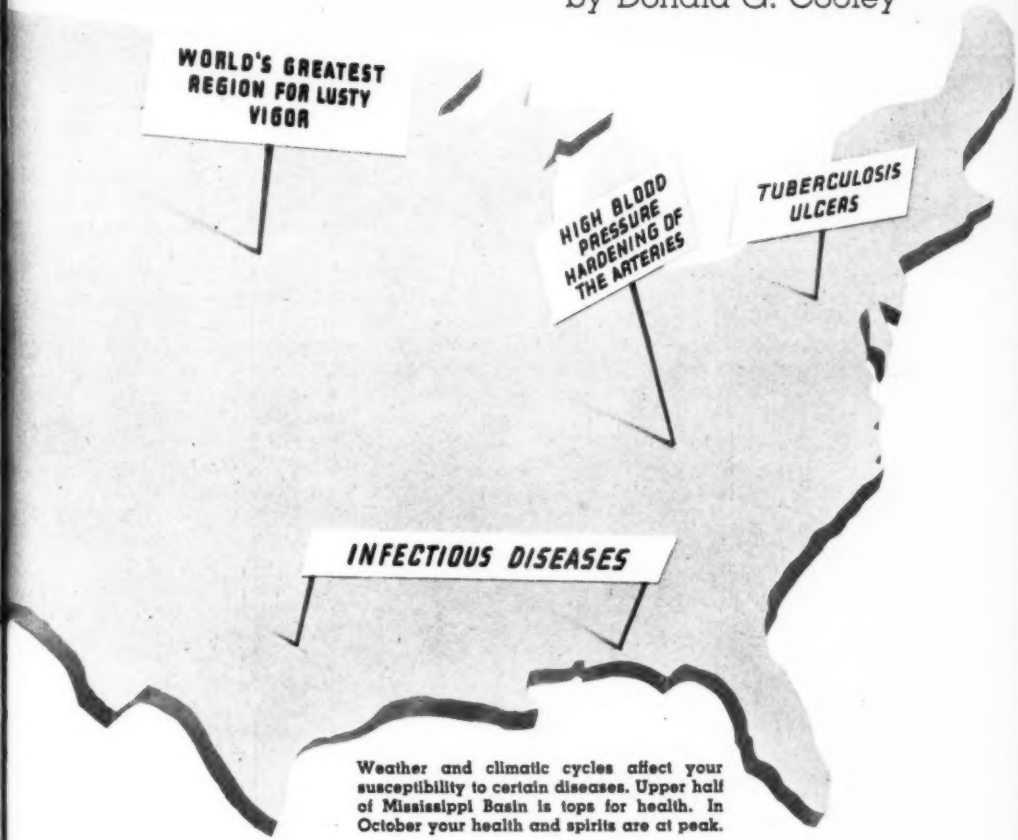
Take the matter of a baby's sex. What statement could sound more fantastic than "you are a man because there was a cold wave 280 days before your birth" or a woman because the weather was warm at the same period? Put that way, it *is* fantastic. Yet Dr. William F. Petersen of the University of Chicago, probably the foremost medical authority on the effects of weather upon the human organism, studied 45,000 Chicago birth records and found that when periods of increasing cold exist at the time of conception, the baby is a little more likely to be a boy. Conversely, periods of greater warmth are associated with femaleness.

This effect, too striking to be attributed to chance, does not mean that weather directly *determines* sex, but that it has some effect on the germ plasm of the parents. Additional evidence is found in a marked annual cycle: babies conceived in October are heaviest, those conceived in April or May lightest in weight. Dr. Petersen has found that the baby "crop" varies in a longer cycle: the newborn are short and broad, then long and slender, then short and broad again, at regular intervals of a ten-year cycle whose crests correspond well to periods of sunspot activity.

The influence of weather upon parental germ plasm is profound enough to affect life expectancy of offspring. "It is practically certain," says Dr. Ellsworth Huntington of Yale, "that on an average the Americans born in February and March during the last century lived at least three years longer than those born in July, August or September." Not only are these folk longer-lived, but there

THE FUTURE

by Donald G. Cooley


WORLD'S GREATEST REGION FOR LUSTY VIGOR
HIGH BLOOD PRESSURE HARDENING OF THE ARTERIES
TUBERCULOSIS ULCERS
INFECTIOUS DISEASES

Weather and climatic cycles affect your susceptibility to certain diseases. Upper half of Mississippi Basin is tops for health. In October your health and spirits are at peak.

are more of them and they include a greater proportion of distinguished people. But, among these February born, there are also more defectives, and the average intelligence quotient is low.

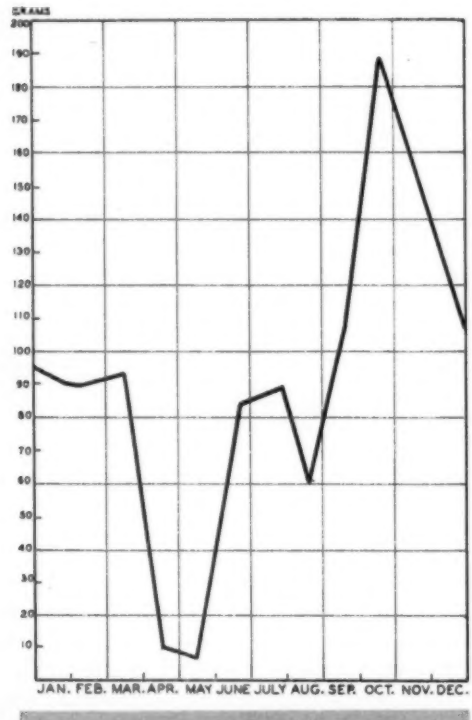
Dr. Huntington suggests that these seeming contradictions are explained by an annual cycle of human reproduction—a "basic animal rhythm" similar to breeding seasons in animals. Typical May and June weather, the season of a young man's fancy, stimulates superior parents to peak physical condition. The season helps the genes, or units of heredity, with the result that children conceived at that time and born in late winter exhibit superior vigor evidenced in a three years' greater life expectancy. Physically inferior parents are likewise stimulated, with the result that more defectives are born; at less favorable seasons these defectives presumably would be rejected by the maternal organism. Whether or not this explains the mechanism, there is little doubt that season of birth does affect longevity.

Indeed, temperature (one aspect of weather cycles) is closely related to fertility. Dr. Clarence A. Mills, medical climatologist of the University of Cincinnati, has for many years been observing the behavior of "cold room" and "warm room" rats. Significantly, rats kept in relatively cold temperatures are almost 100% fertile. But fertility drops amazingly among rats maintained at 90° temperatures; the litters that are born are usually feeble and sickly. At 95°, fertility practically

ceases! The optimum temperature for fertility is 65°.

Such observations almost certainly apply to human beings. July and August conceptions are relatively fewer, and the fertility rate among natives of the tropics—contrary to general impression—is very low.

In other physical ways the human organism is remarkably responsive to weather. Dr. Mills has shown that a severe winter storm in Bismarck, North Dakota, will bring a flock of patients with acute appendicitis to the hospitals. Tuberculosis is not a great threat to southern Negroes, but it becomes devastating when they move north. Ulcer of the stomach, a disease typical of high-tension, worrisome, "go-getter" personalities, is characteristic of people who live in the path of frequent storm tracks. High blood pressure and hardening of the arteries are no great concern to the hot-weather native who is content to doze in the sun. Other degenerative diseases, such as diabetes and toxic goiter, are characteristic of those who live in regions of climatic stimulation.



Variation of weight of newborn infants, according to month of conception, in an annual cycle. February babies have longest lives.

Psychological effects of weather are equally marked. We do our most rapid and accurate work when temperatures for day and night average 60°. Mental activity is a characteristic of low temperatures, not of tropical ones. We do not work fastest on clear, bright days, but at the end of a storm. Dr. Huntington has found that workers are least efficient on clear days, a little more efficient on cloudy days, but most efficient when a storm period is coming to a close. He also tells us that October is the best month of the year for good health and spirits.

With prolonged heat we fall into a more sluggish pace of living. Restlessness and irritability, on the other hand, are to be expected when the barometer is falling preceding a storm. Dr. Mills reports that at such times people even become more forgetful, leave more packages in street cars, and he advises that you avoid difficult customers when the barometer is falling. The family, too, will be more irritable, the children need more discipline, and even fish appear to snap at bait more viciously the day before bad weather sets in.

If these things are true—and hundreds of observations leave little room for doubt—how are cause and effect related? Scientists have amassed convincing explanations.

Easy to understand, because it agrees with common experience, is the statement by Dr. Mills that our general energy level is determined by the ease with which our bodies lose heat. When waste heat is thrown off rapidly, as in cool climates, there is rapid growth, bountiful energy, superior resistance to infection. Warm climates, contrarily, make it difficult for the body to dispose of surplus heat and it meets the situation by depressing energy levels to keep from burning itself up.

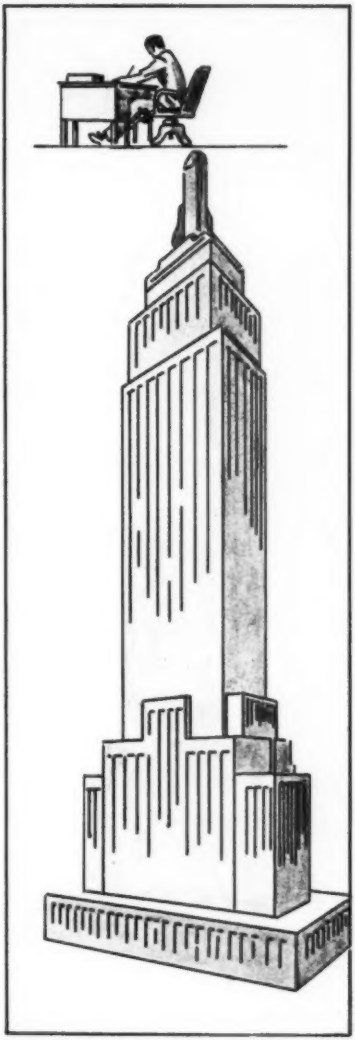
Perhaps you would guess that dusky maidens of the tropics bloom into womanhood much sooner than their sisters of the north. The exact contrary is true. Children of the tropics are two or three years late in reaching adolescence. Dr. Mills nominates the upper half of the Mississippi Basin as the greatest region in the world, because of its storms and stimulating shifts of weather, for "lusty vigor and early adolescence."

An annual cycle in your own glandular system corroborates the depression of warm weather, the stimulation of cold. The late Dr. George Crile, a noted endocrinologist, found that the thyroid gland, which controls

the rate at which our bodies expend energy, enlarges in winter and shrinks in summer. Likewise, our muscles have higher tone in winter, slacken in summer.

The alkalinity of your blood, according to Dr. Petersen, varies with weather cycles. It becomes more alkaline with high temperatures, and its ability to carry oxygen —the vital energy element—is diminished. Easier to measure is the drop in blood pressure which follows prolonged warmth. During the great mid-west heat wave in 1934, blood pressures dropped an average of 30% in a few weeks. This self-defense adjustment of the body takes a little time and explains why there are fewer heat-stroke deaths in August than in July, although August ordinarily brings much hotter weather.

These are only a few of the automatic weather adjustments of our bodies, but enough to show that we do respond to weather in ways more far-reaching than we suspect. For instance, during times of depression when malnutrition and poverty are prevalent one would expect tuberculosis to be more threatening. Actually, the tuberculosis cycle follows a reverse course. It is much more devastating during boom times, which occur, significantly, during periods of greater stimulation.



Barometric drop of 1-inch is equivalent to increasing altitude about 1,000 feet. Like working atop Empire State building.

Depression years or panics very frequently occur during times when the world is warmer than average. Heat was characteristic of world climates during the panics of 1893, 1907, 1920 and 1929. If the present sunspot cycle follows its anticipated course we will have another warm period around 1950 and a panic at that time will not be surprising. And, in 1950, tuberculosis cases should again be at a minimum. The explanation which many scientists advance is that warm periods subdue high energies, encourage northerners to take things at an easier pace. This slowing up as a mass phenomenon affects business, and at the same time banks the fireboxes and restrains people from driving themselves beyond their resistance levels to disease.

Is the correspondence of the tuberculosis with the business cycle mere chance? Nothing is proved because two isolated cycles happen to coincide. Conceivably, you could find a death-rate cycle which corresponded exactly with fluctuations in the price of hardware, and thus "prove" that your Uncle Henry died because the price of nails dropped the day they hanged him.

Cycle studies are based on a much firmer foundation. For one thing, correspondence of sunspot cycles with plant growth, business, mass psychology, rainfall, drought, temperatures, and other functions have been demonstrated many thousands of times. Some of these studies, based on tree rings and geological deposits, go back beyond the Christian era, and the rhythmic nature has been established beyond any possible caprice of chance.

But even more persuasive are the connections between cause and effect which cycle scientists are beginning to establish.

You might doubt that you would refrain from buying a new suit, that you would eat less, or stay home by the fireside instead of going out to a night club, because the barometric pressure was [*Continued on page* 149]

HE INVENTED THE JET PLANE

by Richard Hanser

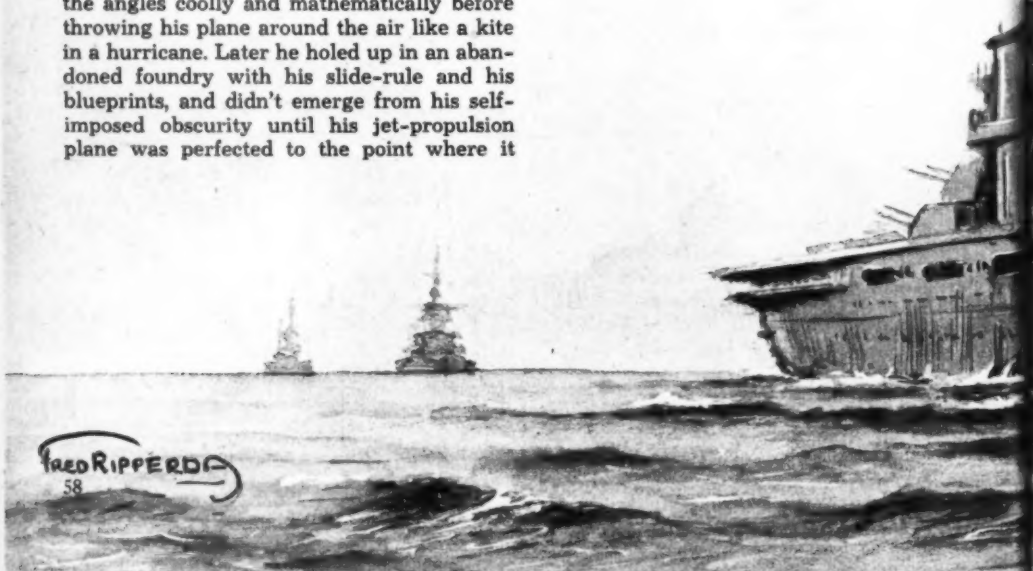
Would you stake your life on a slide-rule? The calmest active genius in aviation considers it safe gambling.

Wing Commander Frank Whittle, inventor of aerial jet-propulsion, has led a storybook life with an engineer's conviction.

WING COMMANDER FRANK WHITTLE is the kind of man who would literally stake his life on his slide-rule, and has done so. He was first a stunt flier who calculated all the angles coolly and mathematically before throwing his plane around the air like a kite in a hurricane. Later he holed up in an abandoned foundry with his slide-rule and his blueprints, and didn't emerge from his self-imposed obscurity until his jet-propulsion plane was perfected to the point where it became the sensation of war-time aviation in England and America.

As an air acrobat, Whittle used to make spectators gasp—and often shiver—at his hijinks in the sky. But he was never the Rover Boy type of pilot who flew by the seat of his pants. When, as an R.A.F. fledgling, he "bunted" (did an outside loop) for the first time in a plane that was regarded as utterly unsafe for that type of trickery, he first took the precaution to consult his slide-rule and work out all the equations involved. Once he had it down in black and white, he went ahead and bunted with complete confidence.

Figuring out the angles on his jet-propelled engine took a little longer—about fourteen years, in fact. As an R.A.F. apprentice at Cranwell, the R.A.F. College, Whittle with the others in his class was asked to write a thesis on future design in aviation. Being the



son of an inventor, Whittle had a bent (his professor calls it a genius) for anything involving lift or flying. His thesis had two main ideas:

To build an aircraft that would propel itself only by ejecting gases, and

To take advantage of the rarefied air in high altitudes by utilizing the lack of wind resistance.

His thesis, of course, won a prize for aeronautical science, and it looked as if the lad (he was only 21) was on his way. But R.A.F. routine didn't permit much mooning around with slide-rules and he was posted to a crack Fighter Squadron where in the course of two years' actual flying he became the best pilot in the outfit. It wasn't until he was made an instructor in 1930 that he was able to get to work in earnest on the school-boy dream of which he had never lost sight.

The "Flying Squirt," as the jet-propulsion plane was promptly nicknamed, makes a whistling noise like a giant kettle at the boil as it shoots through the air. A pedestrian ambling along an English lane not long ago was startled to hear this weird high-pitched whine coming from overhead, and looked up with considerable apprehension.

"But the sky was empty," he later told reporters in awe-struck tones. "Way off I saw a Spitfire, but I knew that the sound wasn't coming from that. Suddenly from the west I saw this queer-looking plane come speeding across the sky, screaming like a banshee. It was like something from Mars. In an instant it was overhead and in another instant it had overtaken the Spitfire.

"Well, this plane passed the Spitfire like a racehorse passing a hack. Just to show off

Jet planes take off like bees, fly faster than sound, lift more load and sound like tea kettles.

a little, the plane banked around in a dizzy circle and vanished upward into a cloud."

That is about as good a description of the Flying Squirt in action as you're going to get until the military authorities decide to turn it loose, possibly in the directions of Berlin and Tokyo. But the story of how the jet-plane covered the tremendous distance between Whittle's slide-rule and the clouds over an English country lane, is an almost classic example of how great inventions are born. All the ingredients are there in their proper order, and Horatio Alger could have sold 500,000 copies of the yarn under the title of "Work and Win, or Perseverence Rewarded."

Whittle went through it all, as prescribed by the story-book formula for becoming a world-famous inventor. The long, long nights of plugging and plugging and plugging—a process which he himself describes, with no originality whatever, as burning the midnight oil. The bitter discouragement and the friends who bucked him up and kept him going. His wife scarcely saw him, and he hardly ever got to see his two sons who, incidentally, were rather busy themselves fooling with model planes. The teacher for whom he wrote his historic thesis at Cranwell, Professor O. S. Sinnat, gave him sound scientific support and valuable technical advice. As Whittle kept working and groping, conventional aviation bounded ahead technically and theoretically without paying any attention to him and his work. The war came, and with it Dunkirk, the Battle of Britain, Crete and all the rest of it. Whittle kept plugging away as if jet-propulsion was the only thing in the world that mattered. And all the time the slide-rule was working overtime.

It was in the early days of 1939 that Whittle and a small band of associates took over the abandoned foundry, which stood in a field several miles from the nearest town. They had little equipment. An unsung genius referred to as "Old Bozzy" improvised tools, machinery and whatever other odds and ends were needed, and swept the floor in off moments. Whittle's "staff" consisted of himself, an engineer and a watchman.

The local citizenry were much intrigued by the goings-on at the decayed foundry, and their guesses as to what was being built there ranged from washing machines to a new and intricate device for manufacturing sausages.

Today the old foundry is surrounded by new buildings which comprise Power Jets, Inc., and Old Bozzy no longer has to rig up equipment out of scraps and pieces. Whittle has all the facilities that modern aeronautical science can put at his disposal. A mile or so along the road stands a modern factory covering several acres. Inside hundreds of people are busy making Whittle jet engines. Outside guards walk up and down along high wire fences.

Before this transformation occurred, however, Whittle had to go through another agony which seems to be routine for aspiring young inventors: he peddled his invention from one business mogul to another looking for backing, and was turned down unanimously and seriatim. He became so discouraged that he failed to pay the renewal on his first patent, taken out in 1930, and came within a whisker of losing his grip on the invention to which his life was devoted. That was when two buddies from the R.A.F. stepped in, slapped Whittle on the back and told him to keep pitching while they went out and raised enough money to organize Power Jets.

The story of the Flying Squirt deviated from the trite when the engine reached the stage where it could seriously be offered for the approval of military experts. Military big-shots are notorious for sneering at inventions which, twenty-five years later, turn out to be terrific. Not this time, though.

On the clear and sunny afternoon of May 21, 1941, a small group of men watched a strange propellerless plane being trundled onto a specially picked airfield in England. Built into the plane was Frank Whittle's jet-propelled engine, which was about to get its first work-out under test conditions in the air. The pilot was the late Lieut. Jerry Sayers, one of England's best.

"It was," says one of the few eye-witnesses, "a moment of tremendous excitement and suppressed emotion, as Sayers settled in the cockpit and the whining of the engine began." The Squirt, incidentally, made less noise on the ground than an ordinary plane, there being no propeller to thrash the air.

Sayers had been advised to take the plane off the ground for a few feet and set it right down again. That was regarded as enough for the first trial run. Instead, he climbed 3,000 feet, described circles six miles around, and stayed up for 20 minutes.

The jet-propelled plane was a success, and the military snapped at it. The British Air Ministry placed orders. General Henry A. Arnold, Chief of the United States Army Air Forces, appreciating [*Continued on page* 82]

CONTINENT OF TOMORROW

NO. 7: ARGENTINA

by Henry Albert Phillips

Seventh in a series of articles taking you country by country through South America.

THERE'S a totally different story to tell about Argentina, because Argentina is a totally different kind of a country from all other South American lands. This does not mean that there is less opportunity there for the forward-looking American going south in search of all that it takes to make a new and more abundant life.

If you make up your mind to go to Argentina then, get rid of all idea of discovering treasures of silver and gold. There are just a few scattered spots, where Argentina begins to climb over the Andes into Chile and Bolivia, where you may find minerals —gold, silver and copper. If that's all you're after, you had better keep right on climbing. The real treasure of Argentina —and treasure there is as thick as needles in a pine forest—is to be found in the land; the soil and the forests. The frontiers are vast; scarcely ploughed and sparsely settled.

Here's a great country, about one-third the size of the United States, but with a population equal only to that of New York, Chicago and Los Angeles combined. You are going to find the climate too, for the most part, like that of those three cities. For Argentina is situated south of the Equator at about the same distance we are north of it.

Unlike in many other South American lands, you won't freeze to death or run out of breath climbing over mountain peaks three or four miles in the sky, or be steam-cooked in hot jungles. In fact, you can travel far in Argentina, in luxury. They've got 250,000 miles of roads, 30,000 miles of railroads, with all the waterways and airways you'll need, to boot. Finally, Argentina is a white man's

At Iguaza Falls, Argentina's Niagara. The great horseshoe waterfalls is one of the tropical wonders of the southern continent.

Gauchos on the Pampas. "Born in the saddle" they wield bolos or long whips to flick out a cheetah's eye.

All the world knows about Argentine beef. This blue-ribbon shorthorn was champ in a Buenos Aires show.

country, with only a handful of friendly Indians down in Patagonia and Tierra del Fuego. That makes Argentina a civilized land of settlers, in a fairly modern sense.

Yet, with a population of 14 millions, of whom only 50,000 are English and 3,000 American, there is still vacant land enough to support one hundred millions! Of 691 million acres composing its total area, 380 millions are still available for agriculture, stock farming and lumber-jacking.

For all that, there hasn't been a "Welcome" on the doormat for Yanquis in Argentina, until fairly recently. We got out with Argentina over the neutrality question at the beginning of the war. In January, 1944, however, Argentina climbed up on the United Nations bandwagon. Now there are good reasons for believing that everything will be hunky dory.

"This is the way it used to be, shortly before the war, in the case of immigrants," they will tell you.

"What do you mean, immigrants?" you will probably retort.

"Well, won't you be an immigrant, coming from a foreign country into Argentina?" they will reply. "Just as some ancestor of yours emigrated into America?"

You will calm down and say, "Anyway, it seems kind of funny, being called an 'immigrant.' "

"Maybe," they will continue, "but Argentina, like the United States, has always relied on immigrants to do a good part of the work, both big and little, in building up the country. All but a handful of Argentine immigrants came from Europe. At least half the in-

habitants of Buenos Aires are Italians! In 1931, 150,000 immigrants came in. With the coming of the war, however, immigration dropped to zero. And for at least five years after the war is over, there will be little or no further immigration.

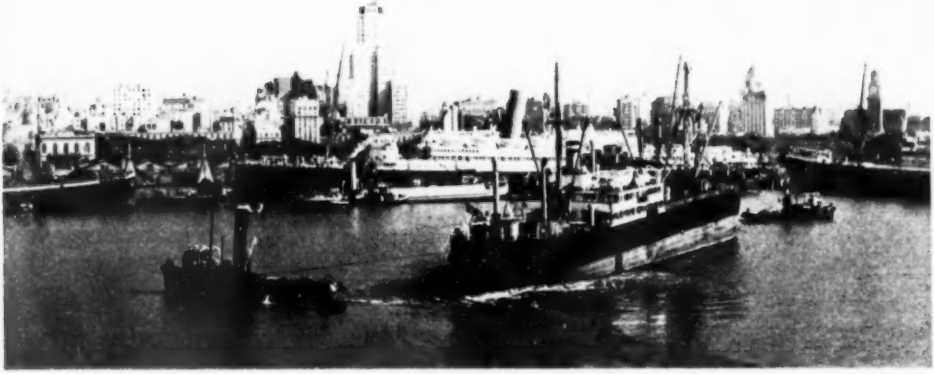
"The immigration laws of Argentina were always the most liberal in South America, if not in the world. In the case of incoming farmers, laborers and artisans, they used to take them by the hand, as it were. First, the immigrant's baggage, tools and furniture were admitted free of duties. Then he was lodged for five days at government expense in the Immigrants' Hotel, which has a capacity of 4,000. There he was given instruction by movie lectures (in his own language, not Spanish) about conditions and advantages in various parts of the country. Finally, he and his family were carried gratis by rail or steamer to the point where he had chosen to settle."

"Nobody could ask much more than that," you have to agree.

"By this time, you will have discovered that there are *several* Argentinas, and you will have to make your choice before plunging ahead full speed."

Even before you land in Argentina—by boat, 12 days out of New York, or by plane, three and a half days out of America—someone else will surely have told

The world's greatest pasture land. Not a pebble on the Pampas. Climate stays very much like our own, but in reverse.



The waterfront of beautiful, modern Buenos Aires, seventh largest city on earth, third largest community in the western hemisphere. A fabulous city still limited industrially.

you, "Buenos Aires is Argentina." Don't you believe it!

Let's look over the land market first. The market prices for good rural properties were not low even ten years ago. Land less than 100 miles out of Buenos Aires, brought $80 (U. S. A.) an acre. Up to 250 miles out, $40. Farther out on the Pampas or in Patagonia, $5 to $15 an acre. Payments were extended over a 5-year period. Besides, there are vast areas of State lands, which the government sells or rents; land in Patagonia, good for sheep-raising, Chaco land, for cotton.

How good are you at planting, sowing and reaping, for now you are coming face to face with the famous Argentine wheatlands?

Years ago, they began settling only in the fertile valleys of the Parana and Uruguay Rivers. Year by year, the farms kept pushing back the wilderness. Within a couple of decades, they were growing wheat over an area as big as the states of Texas and South Dakota. In a few more years, they were saying that if all the good wheatland were to be put under cultivation, producing only a mean average of ten bushels to the acre, the crop would equal one-half the wheat yield of the whole world. At that time, only one-fifth of the total 240 million acres was under cultivation. Nowadays, they are talking about an entirely new wheat region farther south, where there are still more millions of acres of good grain lands.

A great deal of all this is a dream as yet, simply because Argentina, that is longer than our United States, hasn't got the manpower and American farm machinery to handle the job. There's one of the vacuums for you to fill.

From all that has been said, you would think that wheat was the only big opportunity there was down there in Argentina. But the sheep-raising industry is just as big and just as important. In fact, Argentina is the largest pastureland in the world.

Although Patagonia, which occupies a large part of southern Argentina, is occupied in sheep-raising, yet 186 million acres of it is covered with forests. Why should there be any wood pulp paper shortage in the Western Hemisphere, with all that forest wood barely being chipped? The most profitable wood, quebracho, indispensable for the world tanning industry, is found farther north, where 250,000 tons a year are cut and exported.

Whatever has been said about wheat or sheep-raising, is outdone in the production of beef. Cattle ranches, or *estancias,* are often a thousand miles square. Everything corresponds to the cow country of our American Wild West. "Cowboys" of the Argentine Pampas too are "born in the saddle." In place of the lariat, they twirl a rawhide rope with stones or iron balls on the end, called the *bolo.* Instead of a six-shooter, they carry a long whip with a deadly lash, with which they can snap the eye out of a cheetah, or of any two-legged animal as well.

But that's only half the story of the riches in the land. Go over into the Chaco wilderness and there you will find the place where the cotton grows best. Eighty thousand tons, or about seven-eighths of the yield of Argentina cotton is [*Continued on page* 157]

SYMPHONY SIDELINES

BUSMEN, if you believe the cliches, have their holidays pretty well taken care of—but what about symphony musicians? Their idle hours are filled up too, as these pictures show. The symphonic artists shown here—all of them members of the Boston Symphony Orchestra and well-known on the concert stage—are hobbyists with a vengeance. Between rehearsals and performances they putter with the best of 'em.

Above, 'cellist Henry Fabrizio spends his spare time, appropriately, making 'cellos. Virtuosos on the instrument like his work.

Left, Rene Voisin, who forgets about his trumpet long enough to run a commercial rabbit farm. The farm's population: 150.

Above, Jacobus Langendoen, another 'cellist, who goes to town on unflattering caricatures of his colleagues. His victim: Jesus Sanroma, pianist.

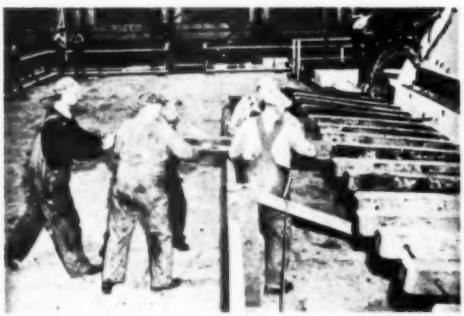
Left, Julius Theodorowicz, violinist and assistant concertmaster of the Boston Symphony. He's a mycologist—an expert on the lowly mushroom to you.

WAYS AND MEANS

YOU have to go behind and under the scenes to know what a project it is to launch a ship. In the newsreels there is nothing to it—except a lady and a bottle and a vast hull and cheering crowds. In reality the job must be minutely and precisely planned by skilled men who cannot miss a trick. It all starts with a diver and ends with the ship making her graceful maiden bow from the ways into open water, but what careful labors!

1 There may be underwater obstructions that divers must find before a ship is launched.

2 Two tons of grease, 14 barrels of liquid wax go down twin runways that are 600 feet in length.

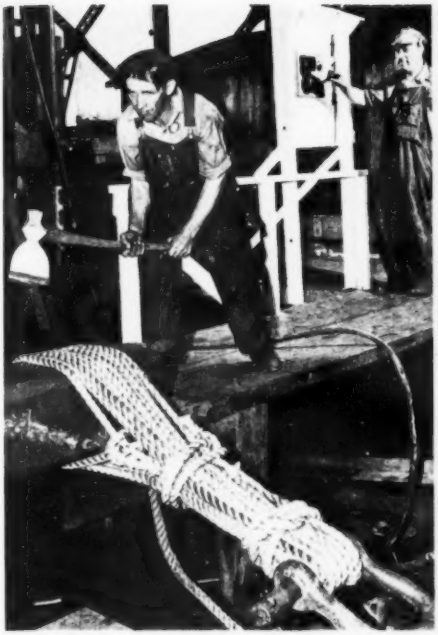


3 To get the ship in her launching cradle, thousands of tons are shifted by huskies from keel blocks.

4 Workmen heave out heavy blocks, that served as hull supports, three hours before launching.

5 The shoring beneath the hull is butted loose. The man in the white cap sees to the timing.

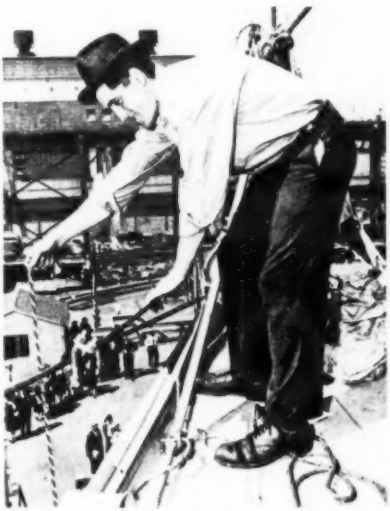
6 Boatmen signal when tide and current are right—then row like the devil out of the ship's course.



7 Dog shores are about to be cut as workman at switch (right) signals the under-hull chief.

8 While watching for the O.K. signals he releases hydraulic gear and ship starts gradually down the ways.

9 At right, what we all see—the sponsor, the ship's bow and the bottle of champagne.



10 But if the lady misses—this anonymous guy doesn't. That bottle must be busted —it's a superstition old as seafaring.

11 And there she goes! And it took more than 100 men to launch this sleek 10,000-ton merchant ship, hidden men.

Reprinted from Air Force *magazine*

THIS is our story:

Since July of 1942, Lieut. G. W. Cook and I had been in the African theater, flying bombardment missions in a B-25 during the air drive to keep Rommel from the gates of Cairo. We had our share of the bombings and the hell that goes with them. And now, with orders in our pockets, we arrived in Cairo ready to board a transport plane for the States and home for a leave. We never got inside the cargo plane.

At the field we saw it for the first time. The British had put on a new paint job, splotches of blue and gray, and orange here and there, but it still gave the appearance of German construction—rough-and-ready, a fighting man's airplane, nothing fancy, but all warplane.

When we heard its strange story we dubbed it "Baksheesh." In Egyptian that's "Something for nothing."

We called it a gift from der Fuehrer.

On a hot September morning of 1943, a 28-year-old pilot at a Nazi airfield somewhere in Rumania decided he had suffered enough of the iron rule and the clicking heel. He went out to the flying line alone and picked the newest airplane he could find—a powerful JU-88, twin-engined high-altitude medium bomber equipped with special cameras. A small card attached to the control wheel said the ship had flown less than fifty hours.

A few minutes later he was in the air, heading for Syria. The weather began to fog up and he was lost, unable to turn back. British Hurricanes spotted him preparing to land on their own airdrome on the island of Cyprus and escorted him in, holding their fire. He climbed calmly down from the cockpit and gave himself up—a prisoner of war. On his plane's delivery plate was stamped the month of manufacture—June, 1943.

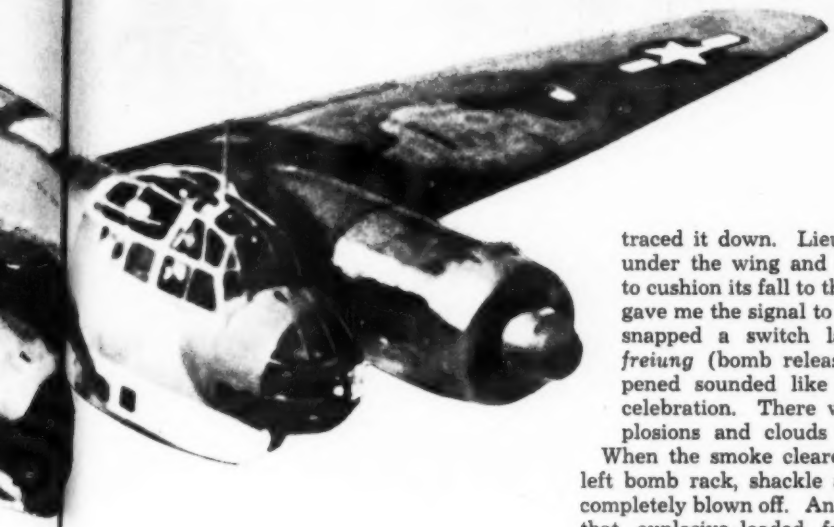
Although the boys were betting two to one that it couldn't be done, Lieutenant Cook and I accepted the assignment to fly the Nazi bomber across the Atlantic and deliver it to Wright Field.

Naturally everything in the plane was German: the readings on the instruments, instructions on the throttles, elevator controls, landing gear mechanisms, flaps, brakes, ignition. We had to familiarize ourselves with each.

The first consideration was a complete overhaul. Our proposed flight was straining the airplane, anyway, and to play safe it was

by Major Warner E. Newby

This AAF pilot started out on a well-earned leave—and wound up hopping the Atlantic in a brand-new Nazi JU-88.



best that everything should be in tip-top shape. Six enlisted mechs from the depot group were selected because of their mechanical aptitudes and their ability to keep their mouths closed, for this was a project we didn't want too many people to know about.

We computed the average fuel consumption and estimated the utmost range of the aircraft to be 1,300 miles with its present tanks, which was insufficient for our planned longest over-water leg of the flight. More fuel capacity had to be arranged and after careful study of the ship, it was decided to hang external droppable gasoline tanks on the bomb racks which are close to the fuselage between the body of the plane and the engines. Two P-38 wing-attachable tanks were secured and our maintenance men set out to apply the bomb-shaped 300-gallon tanks to the Nazi shackles and release—no easy task.

With our unusual fuel tank installation completed it was estimated that we had increased the range of the airplane so that it could fly non-stop for approximately 1,900 to 2,000 miles.

A wing tank was completely installed and we tried out the emergency release. The Germans had it pretty well hidden, but we traced it down. Lieutenant Cook stood under the wing and held onto the tank to cushion its fall to the hangar floor. He gave me the signal to release the tank. I snapped a switch labeled *Bombenbefreiung* (bomb release) and what happened sounded like a Fourth of July celebration. There was a series of explosions and clouds of powder smoke.

When the smoke cleared away, I saw the left bomb rack, shackle and tank had been completely blown off. An inspection revealed that explosive-loaded fastening bolts and linkage rods had blasted the tank free. It was the Nazi way of dropping their fuel tanks —effective, but crude. And to say it didn't scare us would be lying. Lieutenant Cook even sustained minor wounds in the back from pieces of shrapnel. It took two more days to repair the damage. And from then on we decided to use the manual release for the tanks.

The incident led to another thorough inspection of the aircraft to ascertain if it had any other "tricky" devices. One other gadget was found, a small button marked "Rudder Salvo" which we learned (fortunately not by actual experience) never to touch. It, too, had an explosive effect. Once pressed, it set off a series of planted explosives which completely disengaged and demolished the rudder and tail assembly from the airplane, rendering it unflyable. This, we were told, was one of the reasons why so many of the Nazi planes were found intact in the desert clean-up except that they were minus rudder, elevators and horizontal stabilizer. It was an ingenious means the Nazis had devised for making a captured airplane of no use to their enemy.

Although the plane normally carries a crew of four, when it was loaded with our necessities there was barely enough room in the

cockpit for two people so the flight was planned without a navigator or radio operator.

For security reasons we painted the AAF insignia on the lower and upper surfaces of the wings and the sides of the fuselage. In addition, large American flags were painted on the bottom of the fuselage, top and rudder and on the wings. We were taking no chances on getting shot down by an impetuous pilot out for glory. Messages and telephone conversations buzzed all along our route a week ahead of time informing all Allied fields to be on the alert for our plane, safeguarding our passage. It was a strange feeling, flying in a German plane with your own aircraft buzzing all around you.

Our next two days were spent in checking emergency equipment, and I frankly can say that on no airplane have I ever found so damned many automatic devices. You press one button and the escape hatch flops open; another and the lower half of the gun gondola falls off; push a third and the life raft pops out and automatically inflates.

On the morning of October 8, with the day clear and only a light breeze blowing in from the desert, we climbed into the cockpit and kicked over the right engine which leaped to life and purred like a noisy tomcat.

Speeding down the runway I knew that this JU-88 was the heaviest and the most vicious airplane that I had ever flown. It was like trying to get a boxcar into the air. When we reached the proper take-off speed of 160 to 180 kilometers per hour it was still glued to the ground. By this time we had used up three-fourths of the runway and there was nothing we could do but sit there and pray that this hunk of crate would clear herself. Finally, in desperation, I snapped the switch which retracted her wheels and we swooshed through the tops of a row of palm trees.

Lieutenant Cook grinned. "The Wogs (natives) probably picked up a few dates on that one."

At about 4,000 feet we levelled off and had time to check the reason for such a delayed take-off. Much to my astonishment, when I tried to raise the flaps the signals showed they were already in up position. The automatic flaps were too automatic.

We negotiated a landing, ate a light lunch, refueled and took off on the first leg of our cross-continent, trans-Atlantic flight. This time the ship got into the air after a short run and from then on we began to have more and more confidence in the plane Hitler had given us. Our first destination was 1,100 miles distant, a small airfield down on the Nile in the very heart of Africa. We landed 4 hours and 20 minutes later.

We had an opportunity to check the German navigational equipment and the automatic pilot and we found that both were very efficient.

The German radio could transmit and receive, and it had a very good radio compass which could take bearings or be used for homing. Actually it combines our radio compass and navigational compass into one unit.

When we arrived at our first stop, ground crews began immediately to refuel and check the ship. That night both Lieutenant Cook and I didn't get much sleep—only a couple of hours—because we were busy puttering around the plane and working out plans for the following day's flight, which was 1,450 miles distant across desert and jungle territory. We took off at daybreak (Oct. 9) and the flight was uneventful.

At one point along the route, however, I computed a ground speed of 285 m.p.h., which was stepping right along for a bomber of this size. On this occasion we were helped along with a slight tail wind. On the average our speed was about 240 m.p.h., a fairly fast cruising speed.

We were in the air again within an hour and this time headed for the Gold Coast, our last stop on the continent before heading out over the Atlantic. So far we had encountered no friendly aircraft, but wherever we landed the natives and soldiers flocked around.

One major asked if the plane were one of our new bombers.

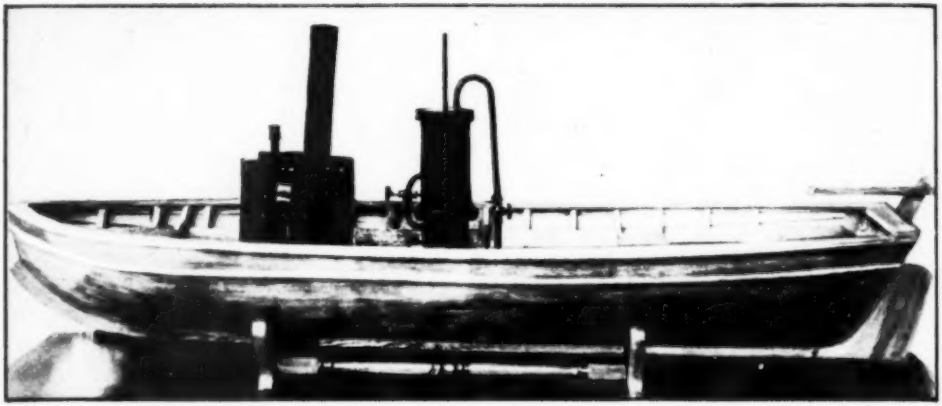
The over-water leg of our journey was just ahead. We were shooting for a tiny dot in the middle of the South Atlantic 1,350 miles away. We were relying almost solely on German instruments to steer us to a spot six miles wide and eight miles long.

There was no trouble in the take-off and the ship handled very smoothly in the over-ocean air, but shortly after we left the coast behind there was a solid overcast and we flew into the thick of it.

Suddenly there was a loud rustling of wind, and cold air struck me on the shoulder. I looked around and saw Lieutenant Cook, white and scared stiff, looking down through the hatch which had come open when he accidentally brushed against the safety latch. The little Irishman was standing there, without any parachute, over a big opening in the bottom of the [*Continued on page* 82]

SCIENCE IN PICTURES

JEWELS OF WAR for Allied engagements with the Axis. Aerial bombs, graceful and functionally beautiful, march down an endless belt under and between batteries of infra-red lamps that quick-dry them. Tanks and much other war equipment are so treated. Before the war your Ford came out glistening after passing similar banks of lamps.

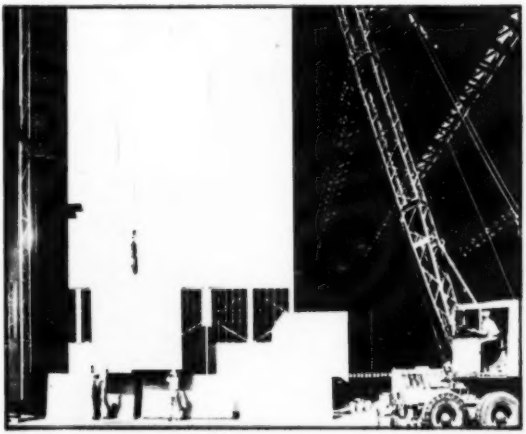


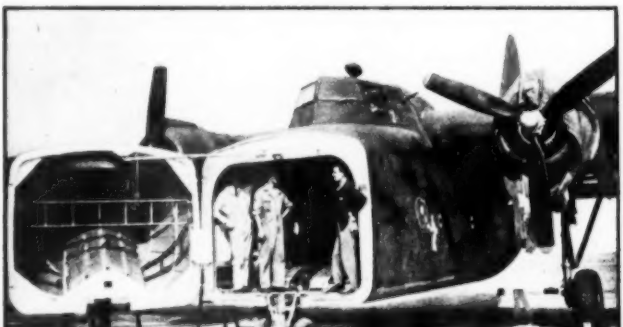
Antique Jet Propulsion

WONDER if Wing Commander Whittle (see page 58) has this model of a steam boat perched on his desk? It's the model built by James Rumsey and successfully demonstrated in 1787. Having no propeller or paddle wheel, it had a mechanism that sucked water through a pipe near the bow, ejected it forcefully from the stern.

Material For Your Dream House

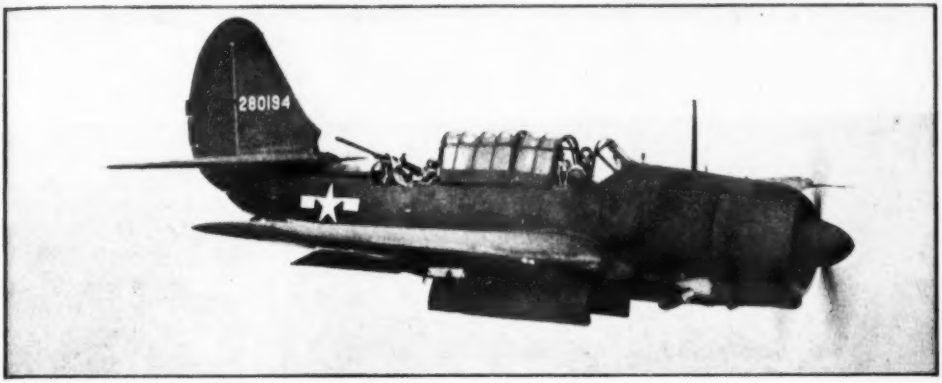
HERE is plywood with a vital difference. The stuff used to burn readily and heat could unglue it. Not now. A pressure treatment (Minalith process), using phosphate, sulphate and boron chemicals, flameproofs a carload of plywood at a time. Heavy timbers made by glued lamination and so treated have higher fire resistance than unprotected steel. Right, a panel is fitted in a blimp hangar.





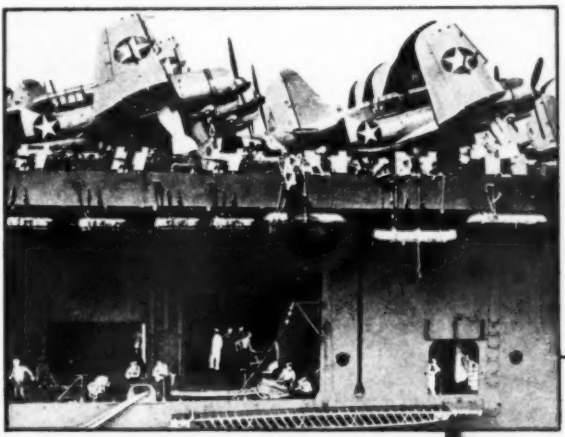
Waiting For Jonah

IN THIS case Jonah is a Jeep. A plastic wood plane designed to carry Army cargo opens its mouth sidewise to be ready for loading. The jeep is its largest morsel. The boys who do the work in and around this huge craft have nicknamed it "woodpecker's haven." It seems to have stolen an idea from the landing ship for tanks. No hometown moving van, this!



The Marines' New Mauler

THIS is the first released picture of the U. S. Marines' Curtis (A-25) Helldiver attack bomber. It's a crack skip, glide, dive bomber and a murderous machine gun strafer. Similar to the Navy's SB2C Helldiver, it has rigid wings, carries main bomb load within its fuselage, mounts four fixed guns in wings and a gun in rear turret.



The Tidy, Terrific Flat-Top

AT AN "East Coast Port" one of our deadly queens has the finishing touches added to her makeup—life rafts are secured to her sides. Don't let those perfectly spaced Helldivers with their folded wings steal your attention from the six 20 mm. guns that line the rail in this one section of the ship.

In the argument of land-based vs. carrier-based aircraft, the carrier holds her own.

Beaming The Ceiling

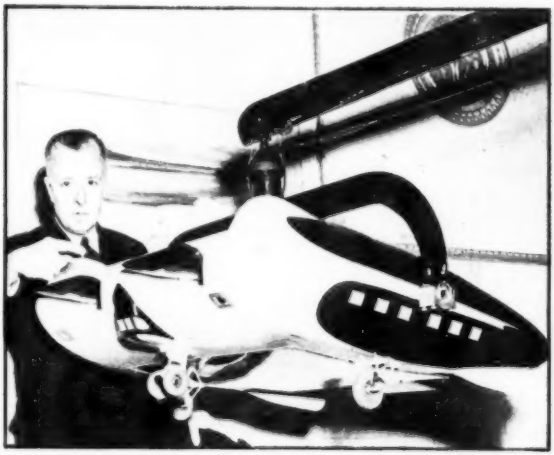
A BEAM of light, 100,000 times as strong as your reading lamp, stabs the night for height of clouds around airports. A Westinghouse scientist draws a bead on the bright spot cast on the cloud-ceiling with an alidade (sighting device). When bright spot is in center of mirror in alidade's lower end, a small telescope is tightened into position and height of cloud-ceiling can be read from semi-circular strip (top of alidade) in hundreds, thousands of feet.

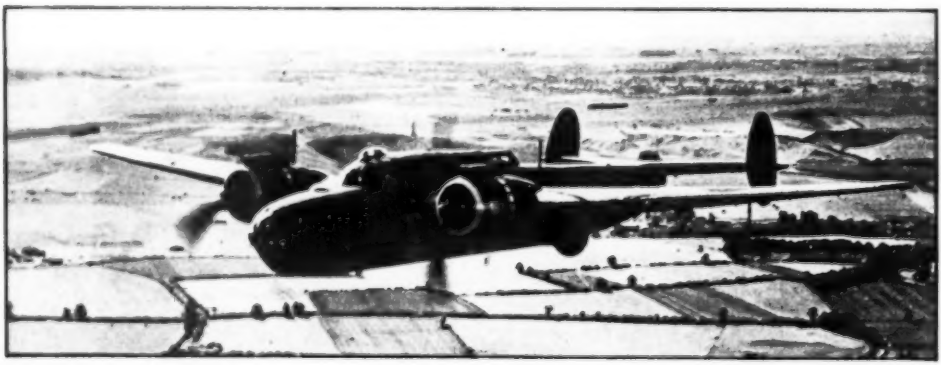
Wizard Of The Radio Tube

LATEST picture of the "father of radio and television," Dr. Lee DeForest (center). It was 38 years ago the grand old man of science invented the audion tube, the vacuum bulb that has had such amazing electronic offspring. He heads DeForest's Training, Inc., works on secret war projects.

It's Tomorrow's Jet Airwing

YES, it has passed wind-tunnel tests. It's Eric Langland's airwing, a stingray-like monster for our future airlanes. Jet-propulsion powers it and the aerodynamic wonder will be able to hover in midair, a la helicopter, the upper section being filled with helium. The inventor points to the intakes for the jet-propulsion. Such designs do away with the useless fuselage (engineeringly speaking) of the modern plane, long a dream of functional aircraft designers. Still, that's for tomorrow.





The Albermarle

FUNNY what they call tugs today. Here's a tug—that is, it's a hauler of gliders. This is England's latest. The Albermarle, twin-engined monoplane, is of composite wood and metal construction. Tug or no tug it looks sweet enough to be a fighter-bomber.

Here's how your car FEELS...

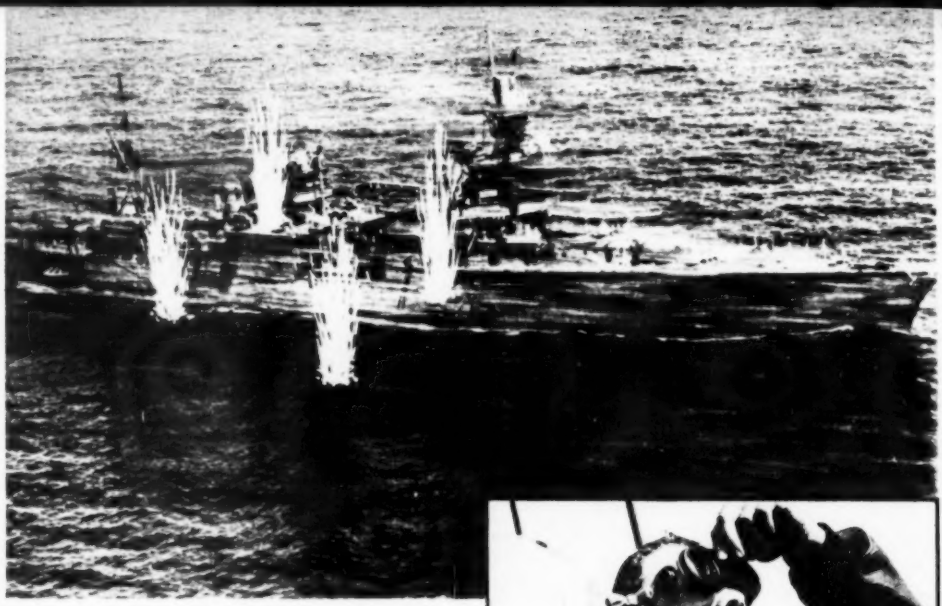
... after

MARFAK

chassis lubrication!

Car drive like a tank? Time for MARFAK chassis lubrication – Texaco's tough, long-wearing lubricant that silences, softens and soothes the crankiest chassis. MARFAK is applied by chart, never by chance. Every lubrication point is indicated – from control arms to rear shackles. Your car gets a careful check-up, too – every point of wear, every point of adjustment. Ask your Texaco Dealer to give your car that "MARFAK feeling" – tomorrow!

TUNE IN: FRED ALLEN every Sunday night. See your local newspaper for time and station.



For And Against Ghosts

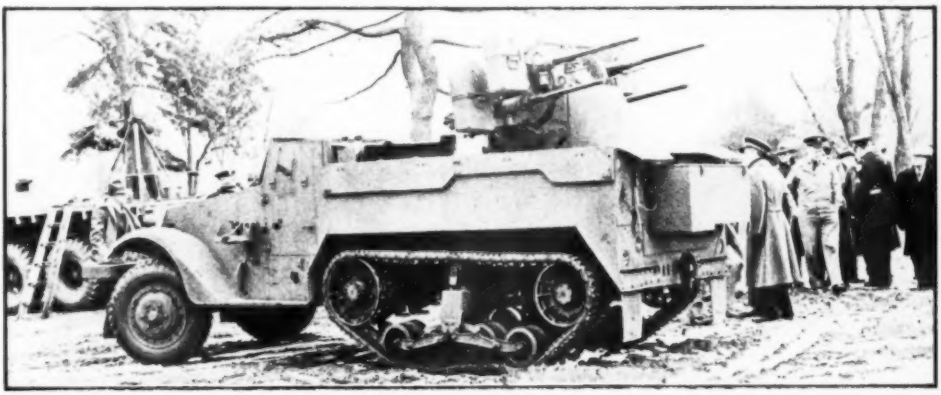
THE phantom warship above is an invaluable ghost target for our Navy. A type of spyglass, Polaroid Offset Wedge, is turned toward a squadron of warships on maneuvers. Far off to one side, out on an empty ocean, these ships are again visible but as transparent wraiths. They are so far away from the real ships, the angle being wide, that it's safe to do target practice on the ghosts. Hits and misses can be recorded as if made against real ships. Direct hits are weird, show up as spouts of water inside the warship. The lookout, scanning the sky for enemy planes hidden in the sun (right), wears a pair of special goggles that can dial out as much light as he wishes and so spot the ghosting tactics of the enemy pilot. Each eyepiece is a pair of synthetic eyes, one over the other. One is fixed, the other rotates with the dial so that light either dims or brightens.

John Bull's Cocktail For Mark

BRITISH Tommies have their own effective slug through the armor for those Nazi Mark tanks. It's the Piat, Projector Infantry Anti-Tank, a light portable gun that fires a bomb weighing just under 3-lbs., can penetrate 4-in. of the finest armor plate. Total weight of weapon is but 33-lbs. This gun, like our Bazooka, is also death to concrete emplacements, pillboxes, etc.

Blind Man's Buff?

THIS is how British fighters get the "feel" of enemy mines they might have to dissemble in action in the dark. The device, Moascar Stocks, is a fence with burlap-shielded holes for arms. In a school in Italy instructors watch the "blind work." At left, two Yanks show fruit of their labors with a Nazi road mine—the vital detonator pin.



Anti-Hedgehopping Half Track

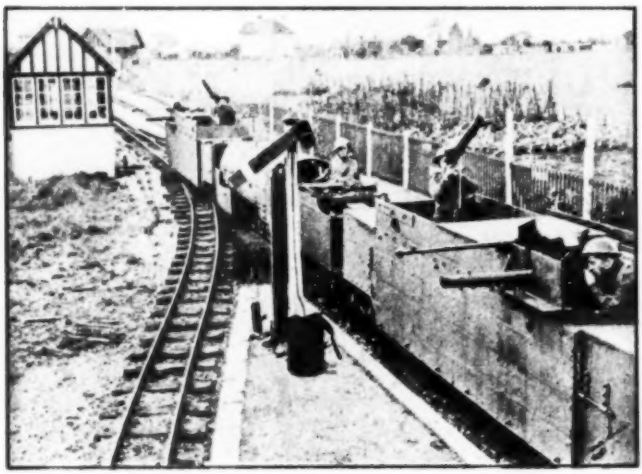
ON THIS armored half track is mounted a power-driven turret that swings four .50-cal. machine guns around to end the career of any enemy low-flying plane. The units, spaced at intervals in a truck convoy, can make strafing mighty costly to the enemy. They have many potent uses as mobile guardians against low air attacks.

Anti-Tank Piat Nazi Style

THE Germans have had a version of the British anti-tank weapon, the piat, for almost a year. A smaller gun, it's considerably lighter than the Allied counterpart, has a less effective range. No figures are available about its armor-piercing ability, but it's doubtful if it packs the ability of the piat to penetrate 4 inches of armour.

Aye, It's An "I" Boat

INTO the harbor of Brindisi, Italy, a prize crew sailed this Nazi I boat. Two British destroyers intercepted an ammunition ferry escorted by two I boats. Three salvos and the ferry blew up, one of the I boats was driven onto a beach and destroyed, the other was captured intact—a nifty feat of war.

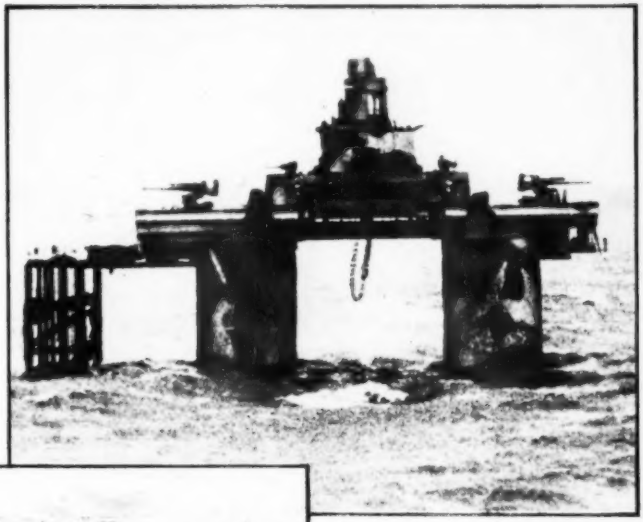


Little David Was Small But O My!

IN PEACETIME one of the smallest passenger railroads in the world ran along the Kent coastline from Romney through Hythe to Dymchurch in England. Now it's armored and armed to the teeth, a mobile patrol faithfully guarding that important area. Its 18-inch narrow gauge has scaled down signal posts and signal houses.

The Ship That Stays At Sea

THE H.M.S. Stationary, called a "seamark" in the British Isles, is one of many anti-invasion monsters that guard England's coastline night and day. Just what firepower she has is not being told, but so far both enemy planes and ships have shown their respect for her by being conspicuous by their absence.

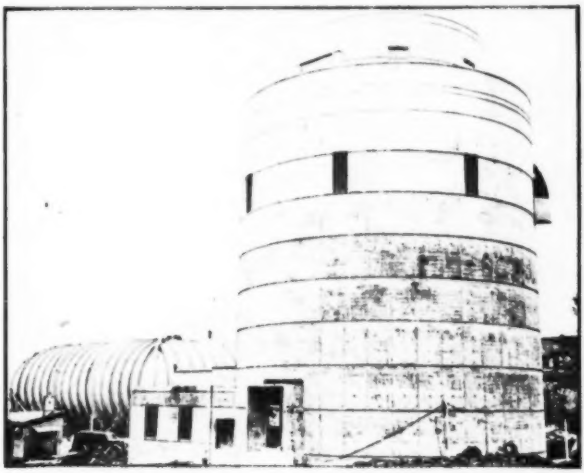


Assault Boats That Come Like Cards

THE latest, neatest trick in assault boats is this folding model that requires one-sixth the space of the ordinary ones. They stack like cards and can be transformed from a flattened package to a navigable boat in less than three minutes, with no bolting.

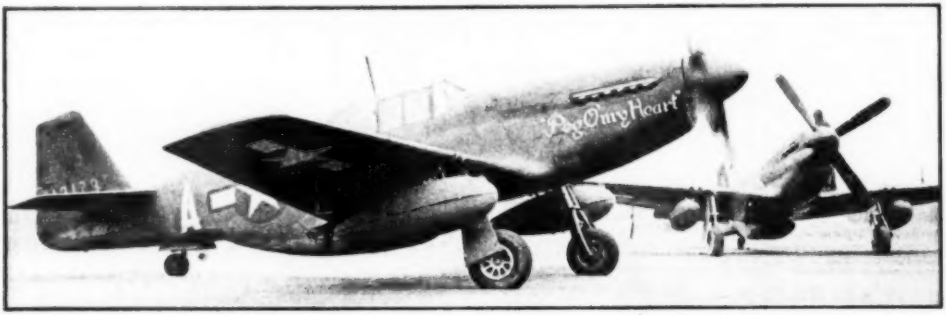
Our Great Vertical Wind Tunnel

THE AAF Materiel Command has the earth's most modern and complete vertical wind tunnel at Wright Field, Ohio. Parachutes and 3-foot models of planes will be tested there. Floating in a 70- to 130-m.p.h. air stream, the planes can be dived, brought out of spins, sent through other maneuvers by activating magnetic rings around the test chamber. The rings, in turn, activate the planes' controls. The tunnel cost $250,000.



Ace Of Eagles

THE new Mustang, the P-51B, has the longest range of any single-engined fighter in the world, flies as fast as any of them. This brilliantly improved airplane is mainly on escort duty with American "heavies" in raids over Germany. The original Allison engine has been replaced by a Rolls Royce Merlin and additional auxiliary wing-tanks have been added (picture below). At left a Captain of Intelligence of the new P-51B Fighter Group in England demonstrates an invention he uses in the briefing room to illustrate the formation and altitude of fighters and bombers on long-range raids.



"Blendkorper"

THE Russians began it with a Molotov Cocktail—the anti-tank shot that knocked out so many of the armored monsters tracked against Russia by Nazi mechanized attack. Here, belatedly, the Germans reply in kind. But this one is a sort of smoke bomb, a chemical weapon found on dead Nazis who were unable to escape advance 8th Army fighters. It's a liquid compound in a glass flask. On impact flask explodes and smokes out tank crew.

John Bull's Beauties

IT'S a rare picture that shows such a line-up of British wings. Front row nearest camera: Mosquito, Typhoon, Spitfire, Proctor, Tarpon, Hurricane, Master III. Back row: Anson, Oxford, Tiger Moth, Lancaster, Magister, Wellington, Havoc, Mitchel, Master I, Stirling. They rest at a flying school in the west country of England, are used as trainers.

Electronic Chemist

A SPEEDY mass spectrometer will simplify production testing in chemical products. It has a cream separator principle—electrified molecules fly off going around a curve, hit a target, are counted for electrical charges.

Truck Plane Director

WHEN the landing field is ready, in rolls this truck with the equipment necessary to an air traffic control tower. No need to wait for permanent installations. It's being tested at Washington, D. C., airport, will be used at the fighting fronts—a boon to G. I. geniuses who have been building plane directors out of scrap at the front.

Gift From Hitler

[*Continued from page 70*]

fuselage and the only thing which had saved him was the fortunate position of his feet. Luckily he was able to brace himself and grab a fuselage cross strut. After struggling with the hatch for a few minutes he finally got it closed.

When we emerged from another cloud bank we saw one of the most spectacular sights I had ever witnessed. Before us scattered out over the sky was a flight of Douglas A-20s being ferried to the combat zones. One of them came in close and circled once to look us over. We waved to the pilot and he continued on course.

Half an hour later we were picked up by a couple of P-39s that came in on a fast swipe and left us hanging there between two beautiful vapor trails. Then they parked, one on each of our wing tips, and escorted us to the small island. We were soon in the air again, headed for the coast of South America—and home.

Now I know how Columbus felt when he sighted land. It was a glorious feeling when the coastline of South America came into view, and we lived every foot of it as we approached. The ship, despite those bets back in Africa, was proving up. She had crossed the Atlantic, the first German combat airplane ever to do the trick—and with an American crew!

At Natal, in one of the best officers' clubs anywhere, we got our first real sleep since leaving Cairo and our first taste of good food and good drink since we had left the States almost a year and a half ago.

Since there was no lap ahead of us more than 900 miles, we removed the P-38 droppable tanks, thus increasing our speed about twelve miles per hour and lightening the airplane considerably.

The take-off for our next destination in Brazil, a small field on the Amazon, was a contrast to the one that day in Cairo. This Nazi buggy fairly leaped into the air and flew like an airplane again. Now it had won our respect. We had utmost confidence in it. The JU-88 was a damned good airplane in any man's language.

We had further proof when we made the flight in record time (3 hours and 35 minutes). We got in without trouble. Landing is one thing this ship does expertly. It's built right in her design. She sits high on the ground, and when she hits and the tail settles the angle of attack increases and slows the ship. Too, the flaps and ailerons lower simultaneously and almost stop the airplane in the air.

Once in the air again, we headed for a field in British Guiana over some of the most rugged country in the world.

On this flight we used no check points, relying entirely upon our German instruments, and came out only half a mile off our predetermined course. We had to fly around thunder showers, but had little difficulty. Our next stop was Trinidad and this landing was accomplished with a stuck throttle. The landing was rough. From here we took off for Puerto Rico and, skirting a tornado, suffered some very rough air, but the ship proved it could take it.

That was our last stop before hitting the States and we were plenty happy when the ship finally came to earth at Morrison Field, Fla., although we learned that we had caused considerable anxiety along the route up the coastline because several air raid spotters had reported a German plane overhead. Three identified it as a JU-88.

The rest of the flight was routine. Florida to Memphis and on to Wright Field, where we landed about sundown on October 14—five and a half days and more than 12,000 miles from our starting point.

"Baksheesh" was turned over to the Foreign Evaluations Branch, a gift well appreciated for its value in future design and engineering developments in American planes.

One thing sure:

The JU-88 can fly the Atlantic.

He Invented The Jet Plane

[*Continued from page 60*]

the tremendous possibilities of the invention, asked that a jet engine be sent to America. The same engine that made the successful test flight was packed in burlap bags and crates and flown to the United States under the solicitous eye of Old Bozzy, among others.

The first successful operation of a combat plane using the jet-propulsion principle took place in the United States on October 1, 1942, with Robert M. Stanley, chief test pilot for Bell Aircraft, at the controls. The next day Brigadier General (then Colonel) Lawrence C. D. Craigie became the first officer to fly a jet-propelled military plane in America.

Advantages claimed for the British jet fighter, the Gloster, include:

Less head resistance, partly because of the absence of a propeller and partly because of simpler engine design.

Higher speed and power for the same weight.

Appreciably higher rate of climb.

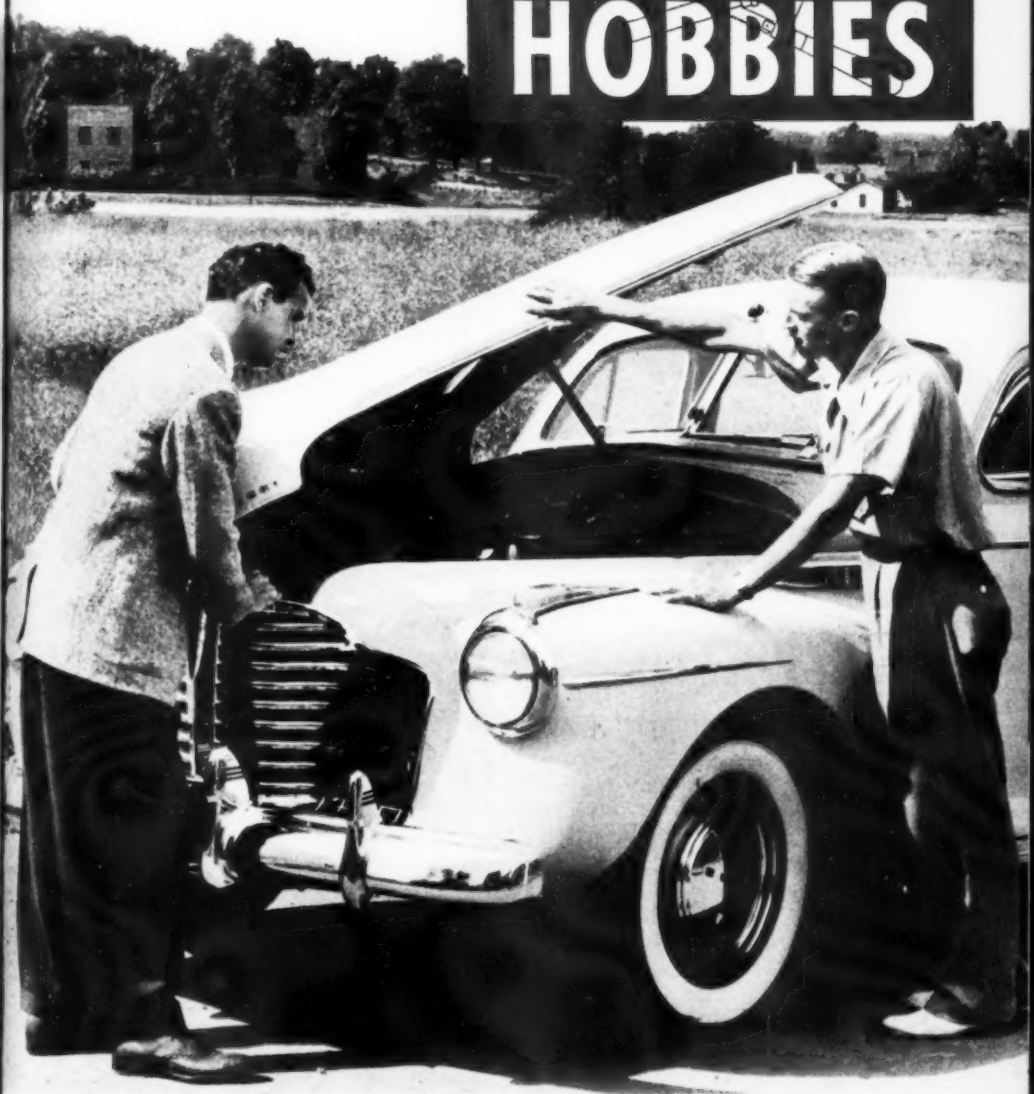
Less ground clearance necessary, enabling a shorter and stronger undercarriage to be used.

Greater overall efficiency.

In addition to its military use, the jet-propelled plane is the subject of sweeping speculation as to its peace-time commercial use. The same principle, it is argued, when applied to passenger planes after the war will make it possible to fly from London to New York and back in a day. That, however, is the usual imaginative prophecy which follows on the initial success of every new invention. Most experts agree that use of jet-propelled planes for passenger traffic is still five or ten years away.

CRAFTS AND HOBBIES

Proper care for your car during wartime. See page 114.

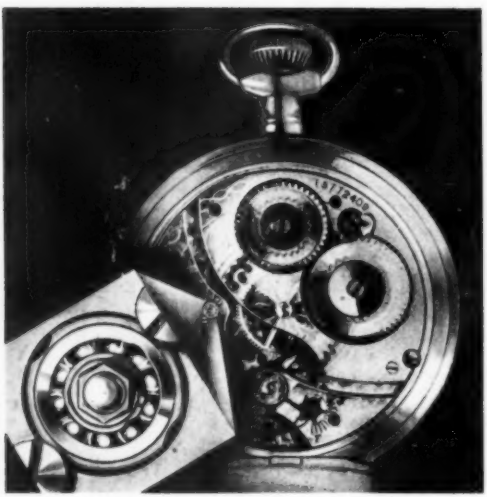


HOME WORKSHOP • GARDEN • MODELS • KINKS • IDEAS
FOR SERVICE MEN • SCHOOL SHOP • PHOTOGRAPHY • TOOLS

The famous ball-bearing works at Schweinfurt, Bavaria, was a target for our Flying Fortresses.

Bearings for Victory

This is the first of two articles dealing with an industry vital to our progress both in war and peace.

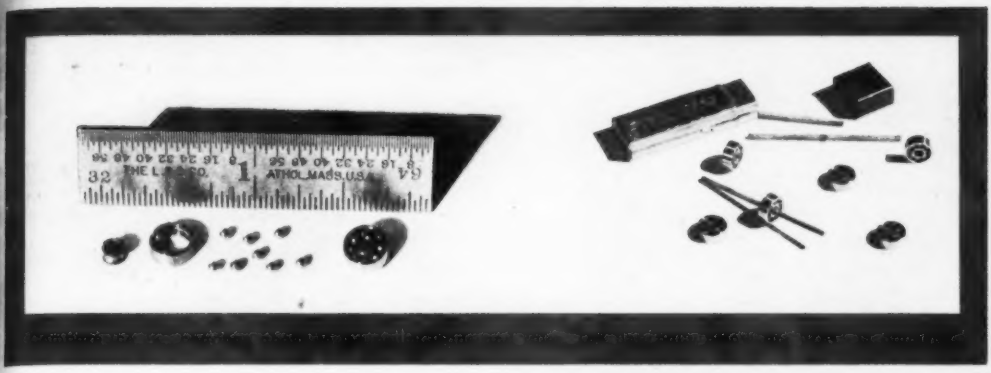


Tiny bearings are used in modern watches.

PART I

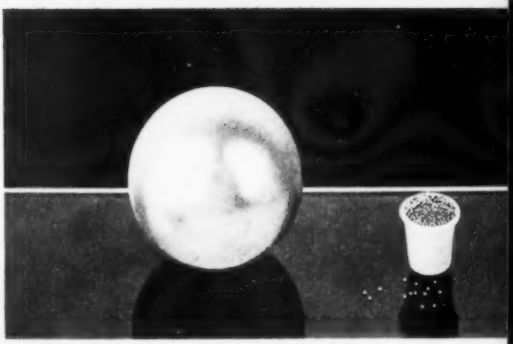
ON OCTOBER 14th of last year the American Air Forces based in England, made a bombing raid upon the German city of Schweinfurt. The raid inflicted huge damage upon the enemy in a most vital spot and so was a success. But for the Americans it was the costliest raid they had made up to that time; sixty bombers were shot down, a greater number than we had ever lost previously in a single mission.

Schweinfurt was a city of which many of us here in America had never before heard. But our Air Force Command knew that the Germans had something there which was worth the great cost of mounting a full scale bombing raid, and they were willing to pay the price to destroy it. The chief industry of the city of Schweinfurt was the production of ball-bearing assemblies, and the importance of that city can be imagined when we stop to



think that every plane, every tank, every gun mount, every battleship, cruiser and destroyer, every submarine and most of the instruments in them and even the torpedo that leaves the submarine—all these things and many others of the German engines of war must be equipped with ball bearings—millions of them. In peacetime, too, the little steel ball is indispensable in every manufacturing plant and factory in the world. In

by Bertram Brownold

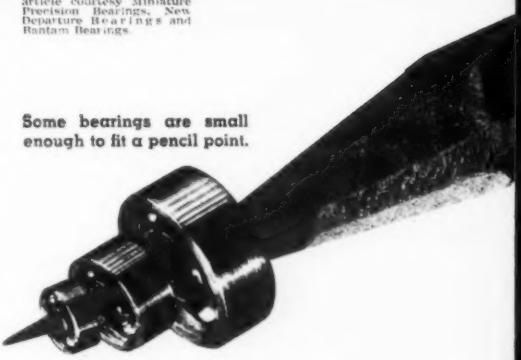


Photos and diagrams in this article courtesy Miniature Precision Bearings, New Departure Bearings and Bantam Bearings.

the home and in the office the ball bearing speeds the wheels of progress. Your sewing machine, typewriter, vacuum cleaner and washing machine, the power tools in your workshop and the electric motors that drive them—all these and many other things, the listing of which would require a volume, could not function with smooth speed and efficiency were it not for ball bearings.

Their manufacture is a separate industry in its own right—a huge one on which all other industry and manufacture depend.

Ball bearings as we know them are about forty years old. They first came into wide-



Some bearings are small enough to fit a pencil point.

Diagram at left shows sliding friction. Balls and pencils change sliding friction to rolling friction.

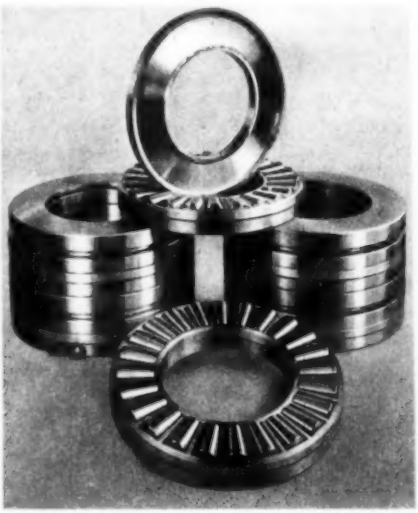
These heavy-duty taper roller bearings are huge.

spread use during the bicycle "craze" era. The development of the ball-bearing industry was largely European, mainly German and to a lesser degree Swedish and English. Much of the engineering research was performed in Germany prior to the first World War. But now *one* factory in the United States is making more ball-bearing assemblies, under pressure of war orders, than all the rest of the world put together!

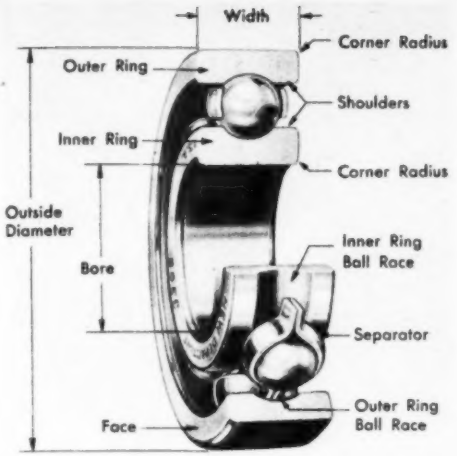
The purpose of the ball bearing and of the roller bearing is to do away with rubbing and sliding friction as far as is possible and to substitute for them rolling friction which is much less. It must hold the shaft upon which it rotates or which rotates within it (as the case may be) so firmly that there is no room for chatter, vibration, play or wobble. In short, a good ball or roller bearing is a precision job of the highest order, and it must do its work in instruments as small and delicate as a pocket watch as well as in the huge gun turret of a battleship. In addition to supporting great loads, ball bearings must function at speeds up to 75,000 r.p.m. in some instances.

Sliding friction in a well-made ball bearing is negligible while the resistance set up by its rolling friction is still less. A ball-bearing assembly for radial loads is a ring of polished steel balls evenly spaced between two steel collars, each ball held in the "pocket" of a "cage" made of much lighter metal. The two collars are known respectively as the outer "race" and the inner "race." The surfaces of these races against which the balls roll are grooved with smooth channels known as "race-ways." The balls roll in the race-ways and are kept from rubbing against each other by the cage.

In another type of assembly, one designed to accept thrust loads, the race members are not two steel rings or collars but two flat steel plates or disks, each perfectly circular and having a hole centered in it for the shaft. The balls revolve between these two plates in grooves or race-ways cut in the facing surfaces. Thrust



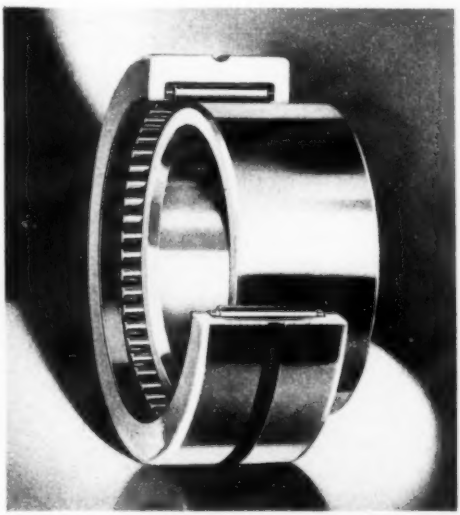
Radial bearing is at left; thrust bearing above.



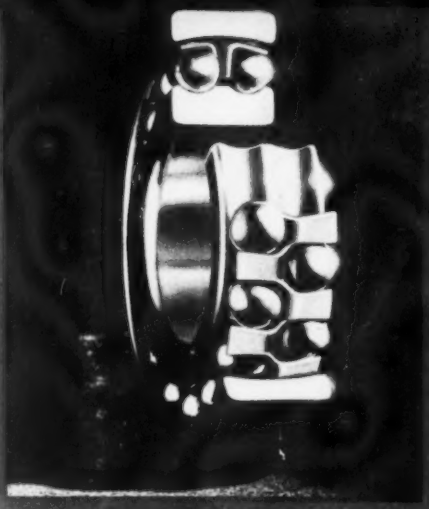
The various parts of a bearing are labeled above.

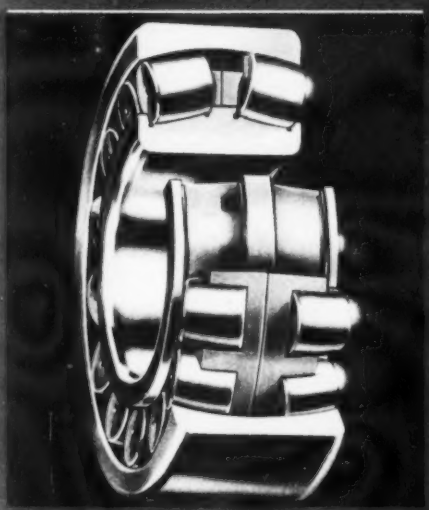
bearings have cages just as radial bearings have.

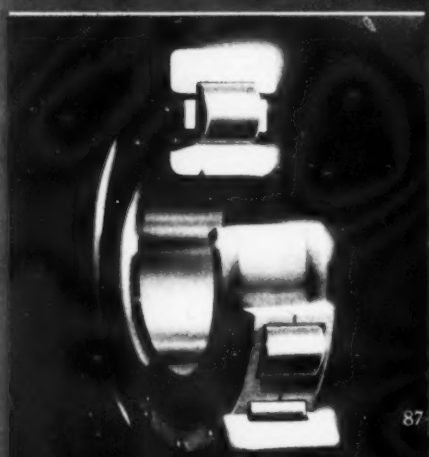
The roller bearing is still another type. It does not make use of steel balls, however, but uses steel rollers. These rollers are usually cylinders of steel, but sometimes they are a sort of combination of sphere and cylinder, steel balls with flat surfaces ground at the "poles." Centered in each flat, circular surface is an axle or trunion. This type of roller, since it partakes of both the qualities of the sphere and of the roller, is usually referred to as a "spherical-type roller" or "barrel type." [*Continued on page* 132]



This is a needle bearing: spherical roller at right.







THE ART OF FILING

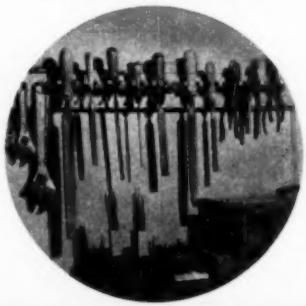
by Josephine von Miklos

Types and shapes of common files that are useful in the home workshop: Left to right: round, rasp cut; round, single cut smooth; half-round, single cut smooth; h.r. taper smooth; taper, single cut bastard; knife-edge; double cut coarse; triangular slim taper; four flat files with varying cuts and h.r. wood rasp.

IT IS said that one of the first things a Navy machinist has to learn is to file a block of steel square. And when the Navy says square it means *square*—within a tolerance of probably no more than a couple of thousandths on each end. It is also said that some machinists never learn; however, the chronicles of the Navy don't say what happens then to the machinists. I have seen many fine and experienced master toolmakers who can't do it either. Of course, I couldn't do it in a million years, but theoretically, I know how a surface SHOULD be filed to get it square, and if you have the kind of patience, maybe you can do it in less time. Actually, in today's regular machine shops, square filing plays no longer the important part it used to play when surface grinders and milling machines were not as highly developed as they are now. However, there are always jobs which must be done by hand, and so it does pay to direct close attention to the process of filing.

The picture on top of this page illustrates the most common shapes of files. There are several basic terms which you might remember when you want to equip your shop with the proper files. For the intents and purposes of the home workshop, you will probably need a wood file, properly termed rasp, and a fair array of machinist's files, using the coarser ones when you want to take off a good deal of material, and the finer ones for finishing. For general surface filing, you use the various kinds of flat files; holes are filed with round files, corners with knife files, squares or three-cornered files, depending on size and shape. Some flat files have "safe" edges, i.e. are smooth on the sides; others have teeth on one or both sides which come in handy when you want to file on two sides of an angle, hole, key-hole, etc., at the same time. This is, however, a somewhat tricky job, because it is only too easy to forget that you are cutting on two sides and things often have an uncanny way of getting to be larger than you expect before you know it and ruining your project.

Like any good tools, your files should be carefully racked.



Brass or copper covers will prevent scratching and marring of all materials to be held in vise for filing. You can make a cover with very strong cardboard.

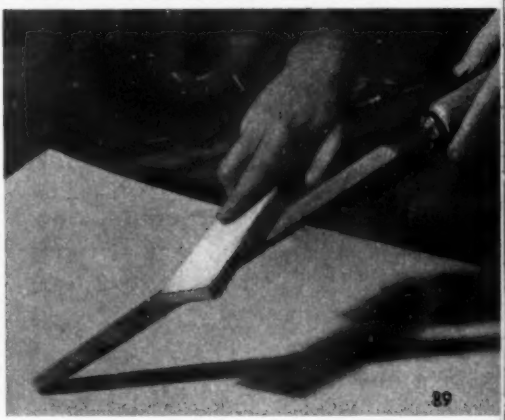
After placing the work in the vise, make sure that the plane to be filed is level, i.e. at whatever angle you want it. If it is to be horizontal, use a spirit level.

Right way to hold the file is parallel to the work. Put the pressure on the top of the file—when you draw it away. Drawing it back, lift it up away from work.

This photo shows the perfect way how NOT to file. This is why you suddenly find those lovely curves on edges of your work which prevent flat surfaces.

To file in small and tight places, you either hold your files as suggested above . . . or you do the best you can with one hand. Use small Swiss pattern files.

It is a good idea to clean your files with a file brush, as shown below, each time you have finished. This will prevent metal from filling up the teeth of the file.



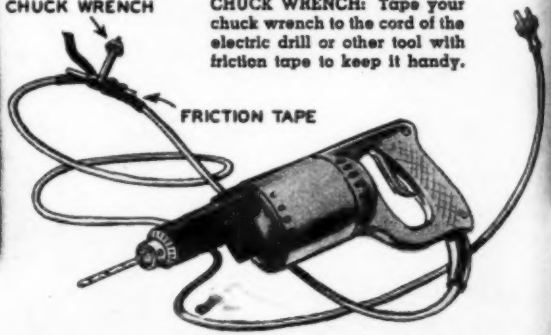
PAINTING SCREENS: When rusty screens have to be painted, a piece of an old rug nailed to a block is more efficient than a brush.

KNURLING: To put knurling on soft metal, use a file and heavy vise as shown. For flat work, substitute round file for rollers.

WORKSHOP IDEAS

SCORING FOR LOCKS: A linoleum knife makes a very neat line around hardware to be mortised into wood. Groove can be made deep enough so chisel for depth cut won't be necessary.

CABLE SLEEVES: Prevent shorting of your utility test battery by providing sleeves for the terminals. Cut them from old hose.



CHUCK WRENCH: Tape your chuck wrench to the cord of the electric drill or other tool with friction tape to keep it handy.

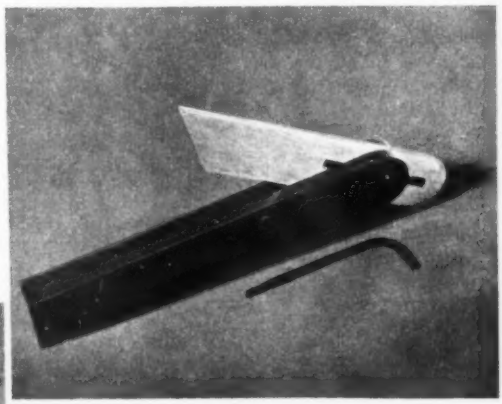
REYNOLD C. ANDERSON

Check your work accurately with this handy tool.

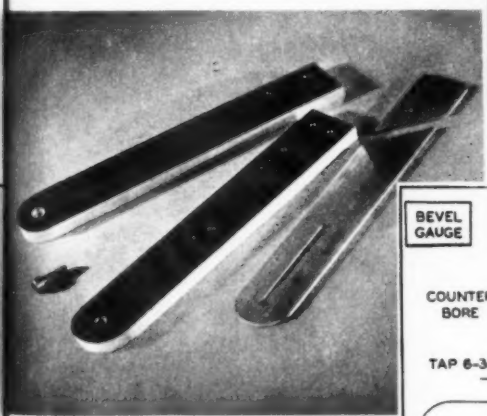
BEVEL GAUGE

THIS simple gauge will be a big help to the machinist in the perplexing problem of working to an angle. For layout work, checking the accuracy of completed parts, or in assembly, it will repay amply the time used in its construction.

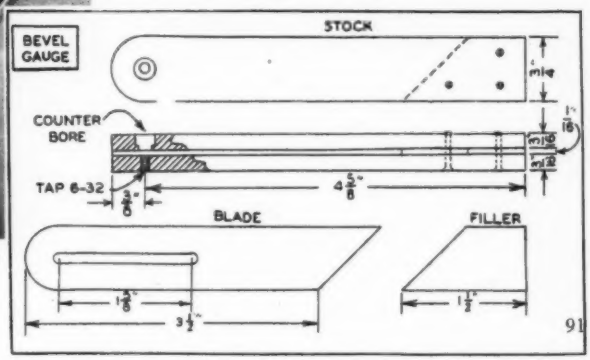
Make it from cold-rolled steel flats cut to shape and riveted together on one end; the blade is held in position with a small Allen head screw on the other. A bevel of a convenient size is illustrated in the drawings, but this can be changed to suit the material at hand or the job on which it is to be used. The two steel flats which make up the body or stock of the bevel are cut to length, rounded on one end and drilled for the clamp screw. The blade is made up from $\frac{1}{16}$" steel slightly longer than the stock so that the filler may be cut at an angle from the same piece. The slot in the blade is cut by drilling a row of holes and filing smoothly to shape. When assembling, drill and rivet the three pieces at one time. The stock can be trimmed up by draw-filing.



An Allen head screw holds the blade in position.



Gauge parts are shown in photo above



IDEAS FOR SERVICE MEN

"AFTER DATING A GIRL for four months whose main duty was to straighten my collar when I put on my pea-coat, I solved the problem. On my next leave I had snaps sewn under each corner. I can reach them and snap them down as soon as I put my neckerchief under the collar. Not only do I no longer have trouble putting on my pea-coat, but I can go out in a breeze, or lean down without having the collar flop up against the back of my head. Of course, a better idea would be to redesign the uniform.

Very truly yours,"

H. C. Monroe, Qm 3/c
U.S.S. YMS 112
c/o Fleet Postmaster
New York, N. Y.

Or get yourself a snappier girl.

A V-MAILER comes to us from Sgt. Wilford Vasher, who, judging from his APO at San Francisco is somewhere West of the Powder River (the one that's a mile wide, an inch deep and God knows how long; remember?).

The sergeant has an idea for a mess kit polisher that isn't bad at all. By one means or another, he gets hold of an old shaving brush, complete with bristles worn down to a length of about ¼-inch. He then gouges out the battered badgers and packs the resulting empty hole with steel wool, obtained easily, he asserts, from the company kitchen or Supply.

NEXT IS AN IDEA which touches on a rather serious and delicate subject, but which nevertheless cannot be ignored, as it is bound to rear its head wherever large numbers of people are forced to congregate or live together, and to be realistic one must admit its existence and face it. Pvt. Jonas Pendell was unfortunate enough to have this problem

thrust upon him only two weeks after his enlistment, and apparently being a level-headed guy he took care of it as follows, without any fuss or embarrassment to anyone:

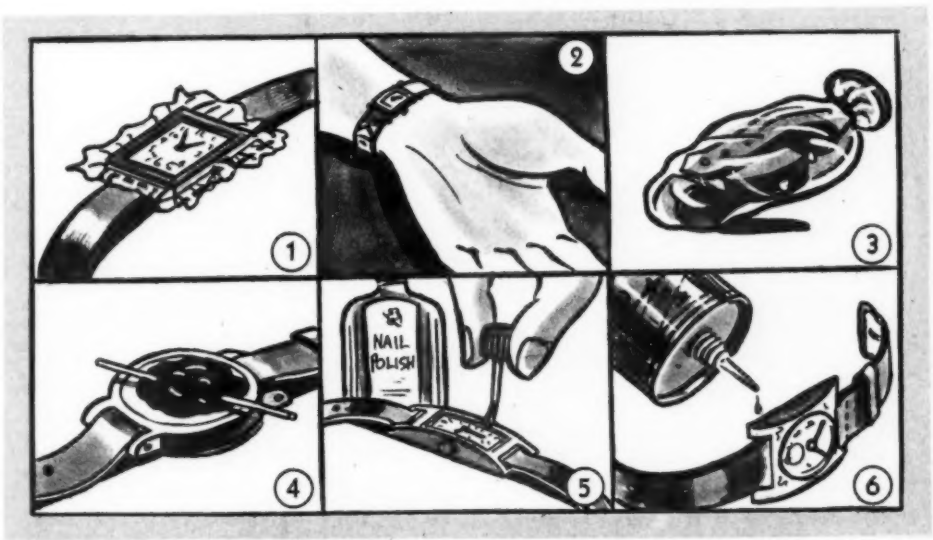
"A short time after I enlisted I had my wallet 'visited.' No doubt I should have kept any and all money in a money belt—but this contraption was too annoying. Pondering awhile I realized that night was the only time one is susceptible to 'midnight visitors' and this is where my private money belt comes in. I simply punched a hole in one corner of my wallet and hooked it to my plastic dog

tag chain. I haven't been bothered since, and neither have the rest of the boys who followed suit. It is with the intention of letting other new soldiers in on this idea that I have written—"

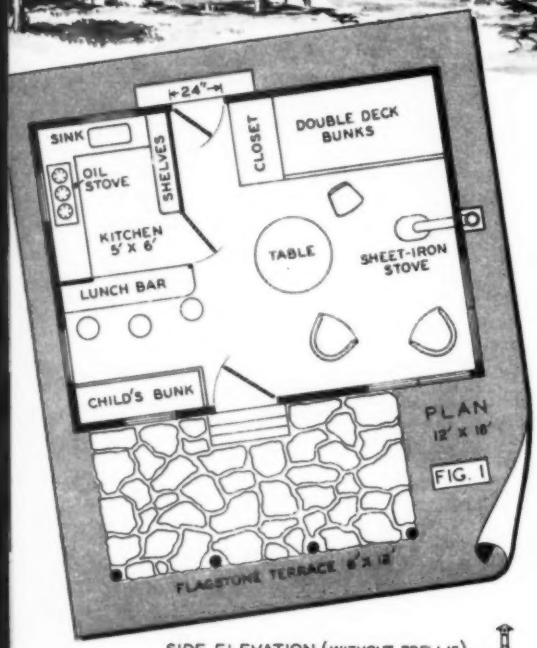
A MAN'S STOMACH is always a major concern, particularly when he is stationed at some remote point far from the goody-strewn paths of his accepted civilized life, and Corporal Michael David, ASN 33233171, Medical Detachment, 804 Engr. Bn Avn, APO 957, c/o Postmaster, San Francisco, Calif., would probably be the first to substantiate this premise.

Cpl. David, "on an Island in the Pacific" has discovered a neat method of making the initial in his D rations stand for the word "delicious." He advises men who are sent to islands where coconuts are plentiful to hoard their D rations after they get tired eating them. A fine confection can be made by grating one whole coconut to one chocolate bar. An efficient coconut grater is easily improvised by punching holes through a tin can with an ordinary nail, then cutting the can down one side and turning it inside out. The D ration bar should be finely shredded with a knife. You melt down the whole business over a slow fire, then let it cool and harden. Result is as tasty as a commercial coconut candy bar, says Cpl. David.

MEN IN SERVICE can be sure of having matches for their cigarettes handy at all times, says David [*Continued on page* 132]



Cabin in the



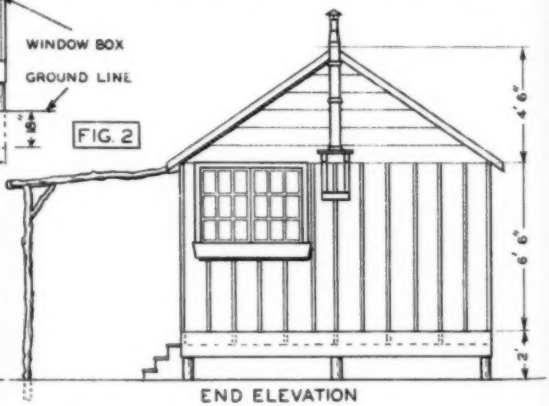
You can build your own summer cabin! This one is extremely simple in design, and necessary materials are non-priority.

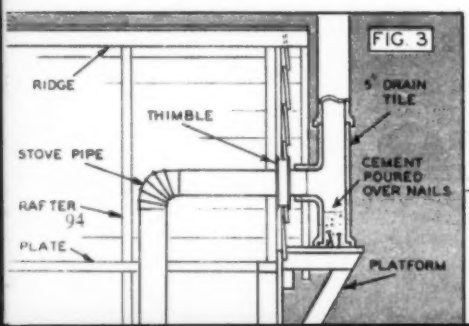
by Hi Sibley

YOU'LL get a lot of fun out of this little cabin, not only in building it, but also in the increased pleasure it will offer you when vacation times roll around. It's inexpensive to construct and to maintain. Even with rough, used lumber from wrecking yards or cheap grades of unsurfaced lumber now available at most lumber dealers, you can make it both comfortable and practical. It can be heated with a wood stove or fireplace on fuel picked up around the premises; kerosene lamps will provide an economical lighting system and help keep your living costs to a minimum. It is designed for three—two adults and a child, but accommodations can be made for a larger number.

In Fig. 1 is shown the 12′ by 16′ floor plan with a sheet-iron stove installation, built-in double-decker bunks, child's bunk, closet and enclosed kitchen with a convenient lunch bar right at hand. Cooking is by kerosene stove, and for the sake of economy and simplicity of construction for the novice, there is no plumbing. General appearance of the little cottage is given in Fig. 2 and Fig. 8; window boxes full of bright flowers add a pleasing

FIG. 2





Country

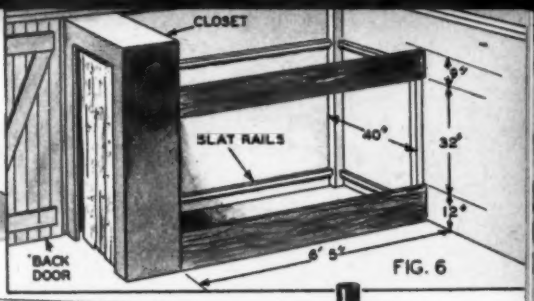


FIG. 6

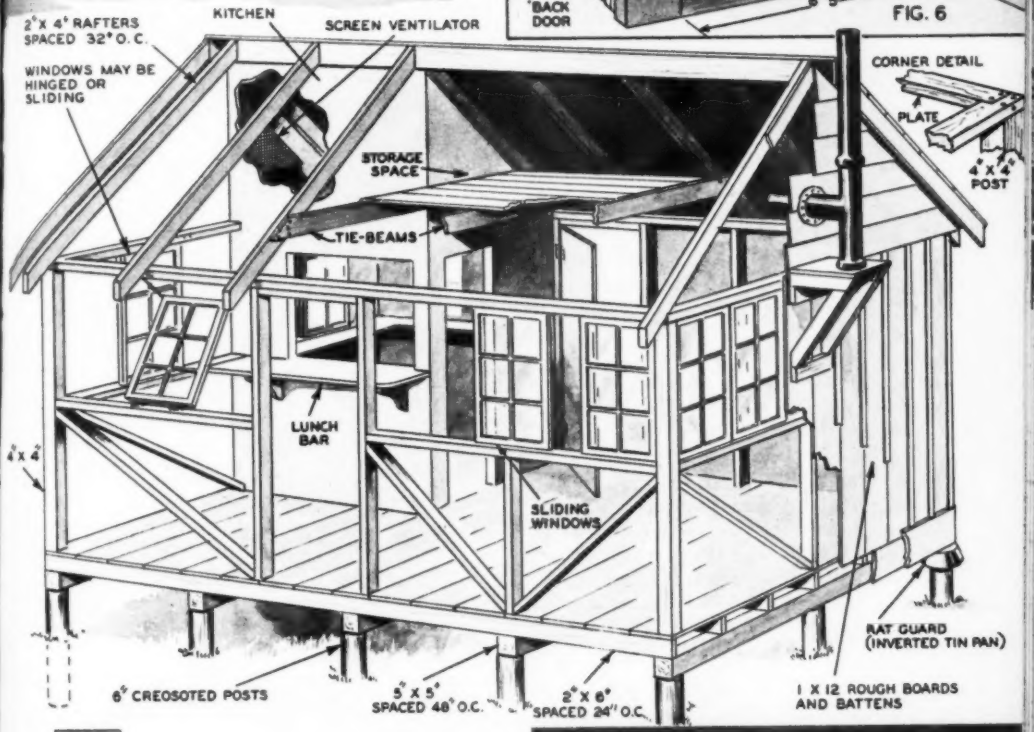


FIG. 5

contrast to the unpainted, weathered boards. An arbor of saplings shades the front of the house and the terrace is paved with flat stones. Note that the house is raised well above the ground for dryness and cool ventilation in damp weather.

The small sheet-iron stove is probably the most economical means of heating a small cabin, requiring, as it does, a small amount of fuel which can be dried logs and brush. To avoid the tricky job of cutting a hole through the roof and subsequent risk of leaks, the chimney is carried out the side as in Fig. 3, an arrangement found entirely satisfactory among ranchers in the Southwest.

A round hole is cut in the gable and fitted with a standard, ventilated thimble through

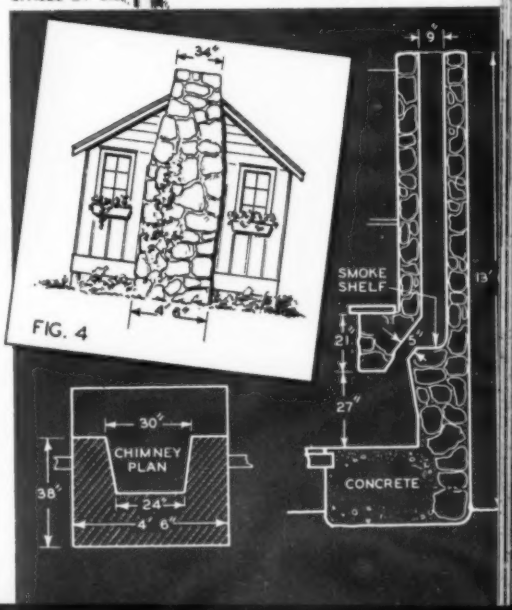


FIG. 4

which the stovepipe passes into a tile-pipe tee. This latter is mounted on a sturdy platform and anchored with cement poured over partly driven nails.

If field stones are numerous near the cabin site, the obvious thing is to build a fireplace and chimney, as in Fig. 4. Dimensions for an efficient fireplace are given in the sectional view, the smoke shelf and throat being important for a good draft. Rough forms can be used to advantage in making the fireplace opening, which should be arched, and the flue should be cemented smoothly inside. If all materials are available, make a thick chimney and large foundation.

General construction is shown in Fig. 5. A house is no stronger than its foundation, and in windy sections it should be especially strong. In this arrangement 6" posts, creosoted below grade, support the mudsills upon which rest the floor joists. A double floor will be an advantage if you have the material, the first made of rough lumber laid diagonally and covered with T & G material lined with tar paper. If the locality is one where rodents are a nuisance, rat guards can be made of tin pans inverted over the posts, and when you leave your cabin, move the front steps away from the door and remove all annuals from around the base so that it will be impossible for the field mice, rats and rodents to gnaw their way inside.

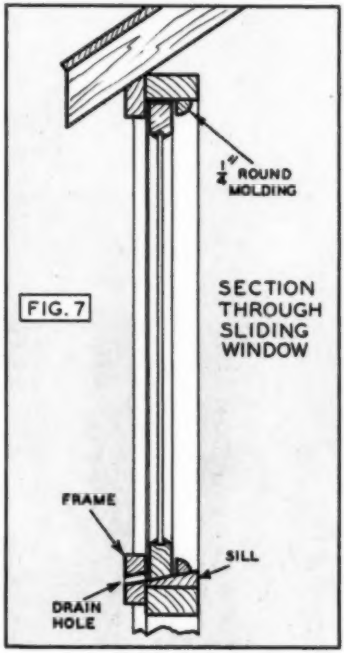


FIG. 7 SECTION THROUGH SLIDING WINDOW

Diagonal or "sway braces" should be installed at all corners, and the horizontal two-by-fours should be made absolutely parallel with the plate so that the sliding windows will not jam when moved from one end to the other. The framework is completed first and the boards and battens are installed before the rafters are set. Incidentally, the battens should be nailed only on one side of the joint; when nailed to both boards, they tend to split when the boards shrink—as they most certainly will in very dry weather. The kitchenette, 5' by 6', is enclosed so that most of the cooking fumes will be carried up and out the vent in the gable.

A sectional view, [*Continued on page* 136]

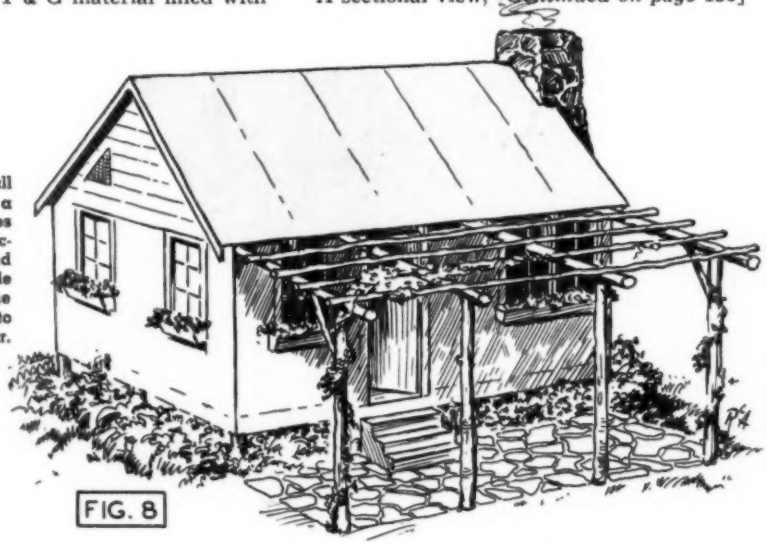


FIG. 8

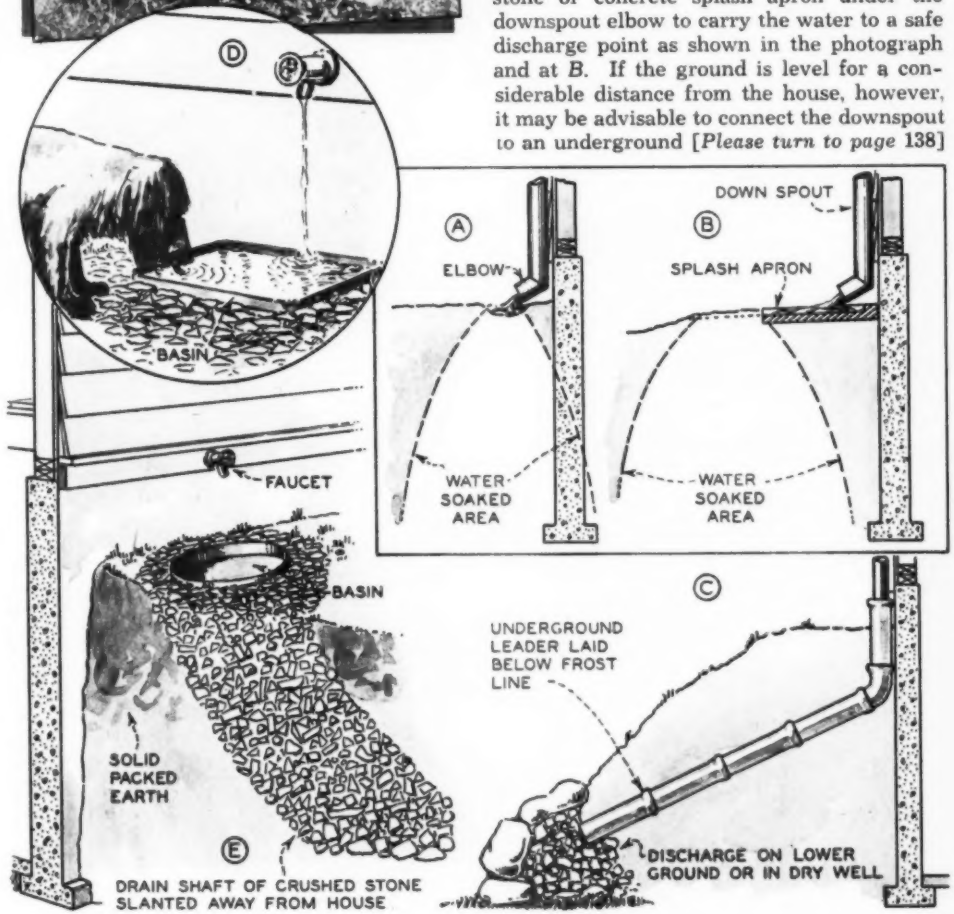
The addition of a small terrace protected by a spaling arbor makes the cabin more attractive in appearance and provides a comfortable lounging spot for the owner. Train vines to climb over the arbor.

KEEP YOUR CELLAR DRY

Use these simple methods to keep drain water away from your foundation wall.

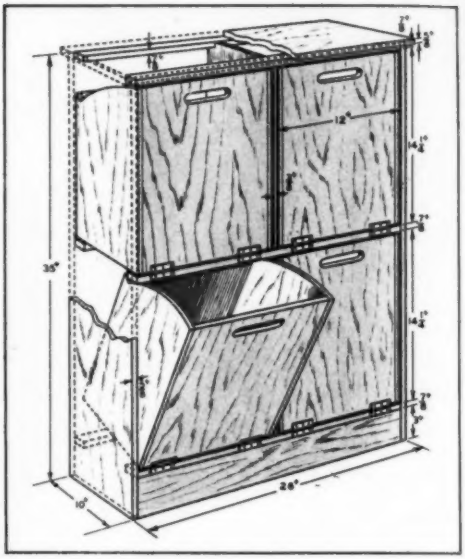
by J. Modroch

DON'T invite drain water into your house by permitting it to seep down the outside of the foundation wall where it might penetrate and cause dampness. Drawing *A* shows a downspout discharging arrangement that invites trouble, since the foundation wall is subjected to a soaking with every rain. This condition can be corrected by laying a stone or concrete splash apron under the downspout elbow to carry the water to a safe discharge point as shown in the photograph and at *B*. If the ground is level for a considerable distance from the house, however, it may be advisable to connect the downspout to an underground [*Please turn to page* 138]



PLYWOOD VEGETABLE BIN

A convenient storage place for your vegetables.

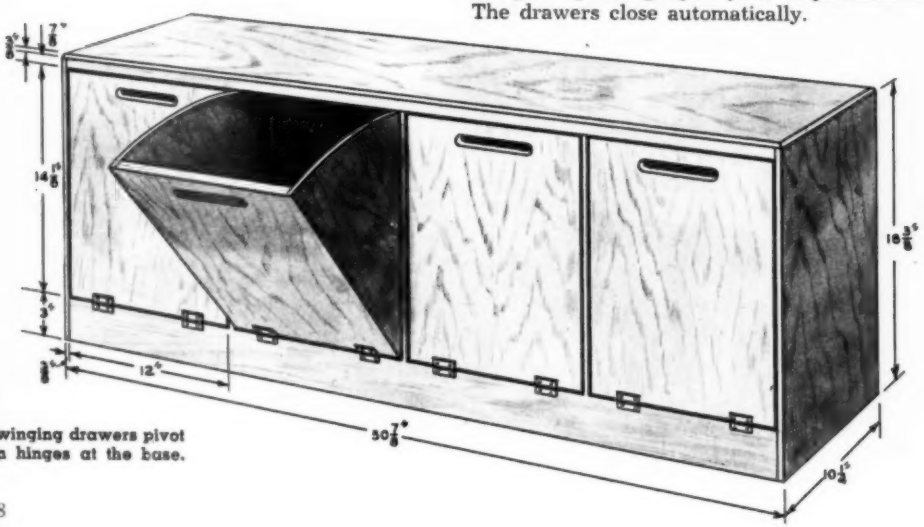


Simple construction of four-drawer type.

by Reg Walker

THIS vegetable bin can be knocked together in a few hours of your spare time. It's an especially handy item for small-home owners or small-apartment dwellers who are pressed for a little extra space in which to store not only vegetables but also rubbers, cleaning cloths, clothesbrushes and other articles which frequently become lost.

These bins can be built with any number of compartments in a single or multiple tier design, depending upon your requirements. The drawers close automatically.



Swinging drawers pivot on hinges at the base.

Pipe Making

Have you ever wondered how that pipe of yours was made? Here's the answer.

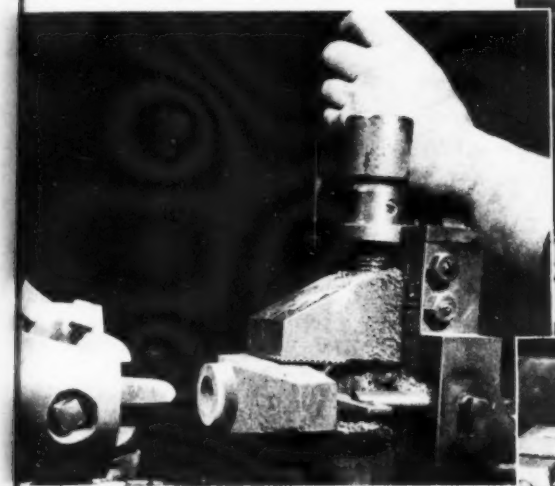
MECHANIX ILLUSTRATED
photos by Lisa—Graphic House

Wide World Photo

Movie director George Sidney likes a periscope pipe.

OUR grandfathers' trusty briars were carved laboriously by hand, and so, too, are some of the imported varieties at the present time. As a rule, however, the pipe-making industry has felt and responded to the modern trend toward mass production, and those graceful, cool-smoking models we enjoy today are right off the pipe assembly line. You might try a few on your wood turning lathe. Get the Carolina briar or burl root at your pipe store; they'll order it for you.

First step is selection of briar blocks. Algerian briar, hundreds of years old, has best grain.



Next the pipe block is placed in a special tool which bores the tobacco hole and shapes the top.

Block is held by spreader in tobacco hole while being shaped by saw blade seen in right of photo.

The photo at the left shows your pipe after each of the five steps in its manufacture. Hand carving takes a long while, but special machines can turn out a pipe in 10 minutes, exclusive of 24 hrs. drying time for stain.

The shaping or frazing machine which shapes the lower part of the bowl and the pipe stem is shown at the right.

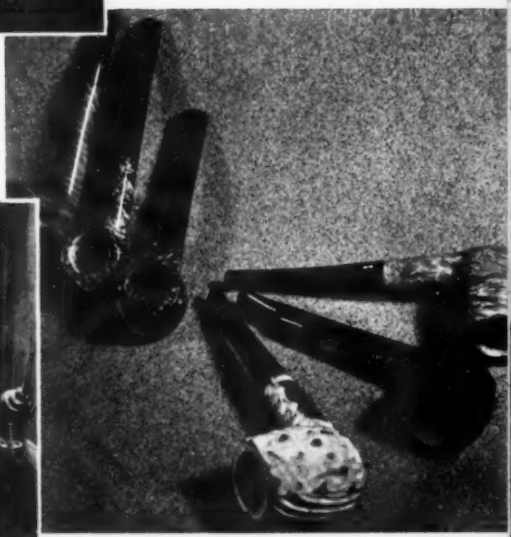
These are the pipes as they come from the frazing machine. The operator determines the exact shape by watching the grain carefully while cutting progresses.

Next the pipe stem is drilled to take the bit. Vise at the left holds the pipe in position directly opposite the drill. This operation is accomplished by a single motion of the man at the tool; he pushes a lever and—it's done.

After the stem is drilled, the rubber bit is fitted with a plastic condenser and inserted in the stem. Then the rough pipe, complete with bit, is sanded to a smooth finish with a disk sander, first with coarse then fine paper.

The next step is staining. Various grades of walnut stain bring out the rich grain for which briar is famous.

The final step is shown below. When the stain has been allowed to dry for 24 hrs., the surface is buffed, then varnished, dried once more and polished.



In the photo above are some of the styles as they come off the production line: long ones, short ones, fat ones, thin ones—any shape to suit your fancy. Pictures were taken at the factory of the Capitol Briar Pipe Corp.

THE SCHOOL SHOP

Conducted by Gilbert Paust

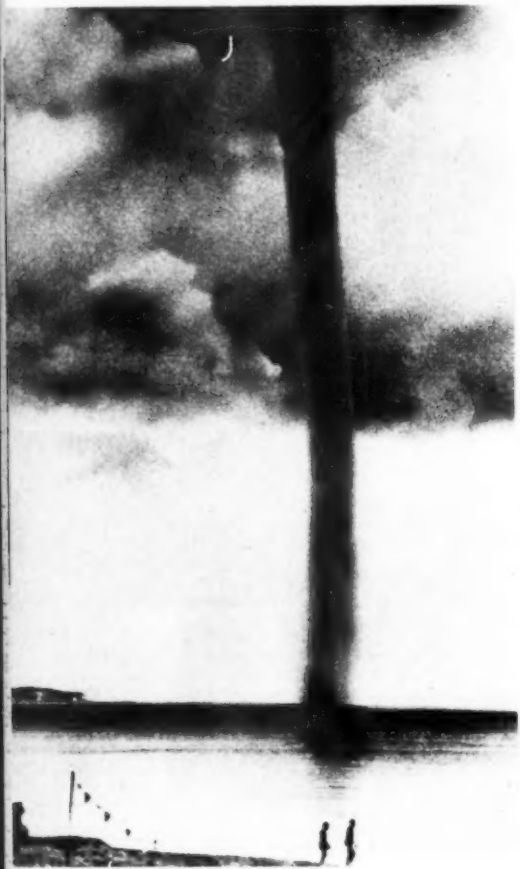
Lieutenant, Civil Air Patrol, Westchester Squadron

Lesson 15—How Pressure Makes Weather

TORNADOES sweep across the plains of the earth, hurricanes beat against the seacoasts and waterspouts whirl their way over the oceans. Countless millions of dollars of damage are caused every year by these phenomena of nature.

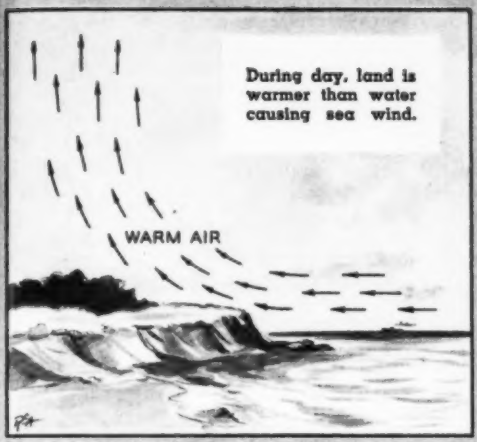
They uproot homes, take lives and prove a constant menace to shipping. We can't stop them, even though we know what causes them. The best we can do is get out of their way as soon as we learn that they are headed in our direction. And strange as it may seem, when one of them comes along, we're safer in a plane than we are on the ground because the plane has the necessary speed to get out of the way. In our little jenny we have a ring-side seat for the entire performance; we can fly right around the storm without too much trouble and get a first-hand view as it goes by—but let's not get too close!

Waterspouts such as these occur in cyclone areas.



The culprit responsible for atmospheric disturbances such as these is pressure which is closely allied to temperature in the general scheme of weather. The relationship between air temperature and pressure is an interesting one. We have learned in previous chapters that when the temperature of a mass of air rises, the air expands and its density and pressure decrease. When its temperature falls, the air contracts and its density and pressure increase. When considering masses of air at approximately the same altitude, therefore, we must remember that hot air is light air with a relatively low pressure, while cold air is heavy air with a relatively high pressure.

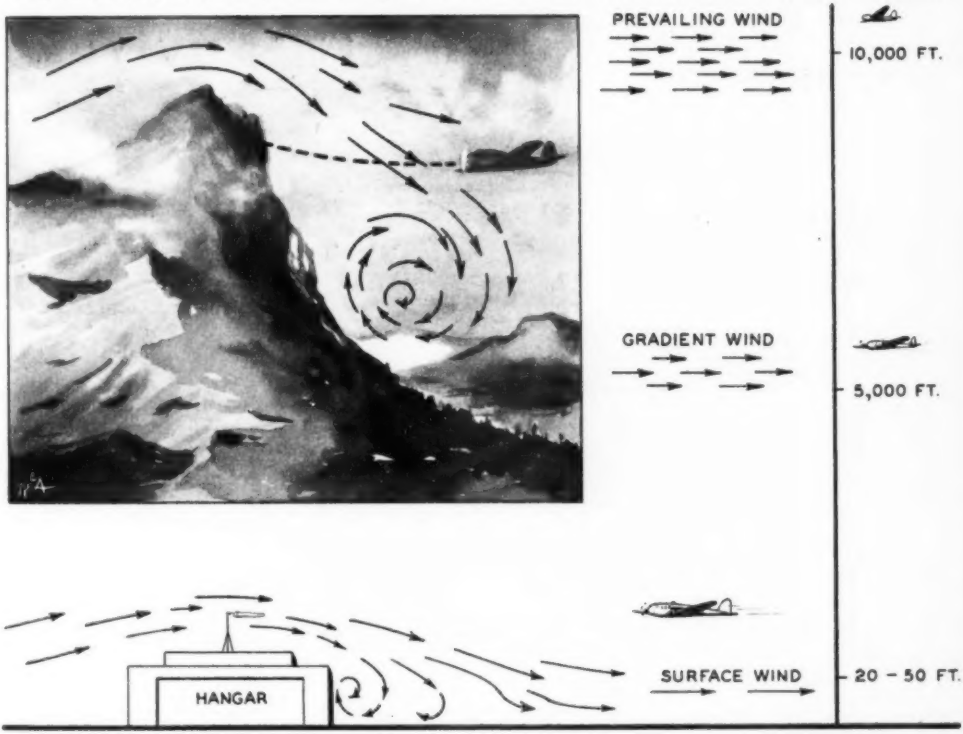
Uneven heating of the earth's surface by the sun, including the unequal distribution of the sun's heat from the Equator to the Poles, sets up on the earth just this condition of light and heavy air masses. They exist side-by-side and obey a fundamental law of physics. To understand what happens, let's perform a very simple experiment. We'll take an empty tumbler and study what occurs as we fill it with water. Originally the tumbler is not really empty; it is filled with air. Water is heavier than air, and as we pour it, the lighter air is displaced and lifted to the top of the tumbler by the heavier water which settles at the bottom. Air masses of different pressures behave in exactly the same way. The cold air is heavier and flows under the warmer, lighter air, displacing and lifting it.



This air motion is nothing less than our old friend, *wind*, which we have met many times before.

A region of high pressure air on the earth's surface is called a *high* or *anti-cyclone* area; a region of low pressure air is a *low* or *cyclone* area. Wind always blows from a high to a low, and the greater the pressure difference between a high and low, the stronger the wind that will blow between them. The wind

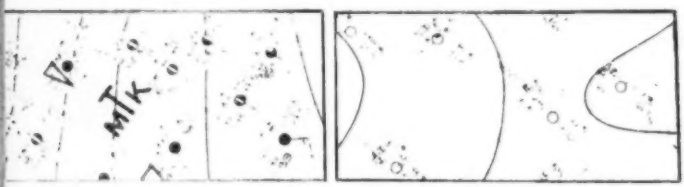
With an increase in altitude, winds increase and blow from the west. Avoid turbulence near mountains.



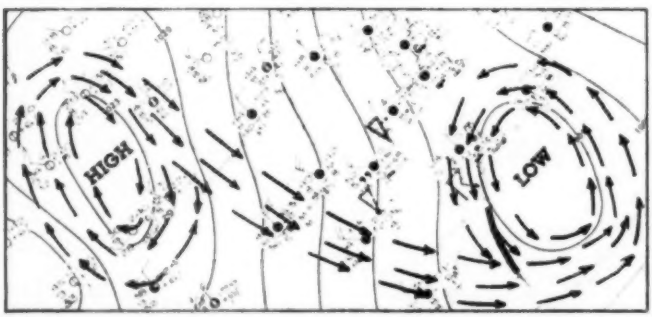
reaches its maximum velocity in the low, and it is here that temperatures mix, air is cooled to the dew point and condensation and precipitation form. The low, then, is the storm area and provides the roughest flying for the pilot.

The exact way in which highs and lows form will be discussed in a later chapter as will the subject of weather maps. I might mention here, however, that high and low pressure areas on a map are indicated by *isobars*, which are lines connecting points having the same pressure. They correspond to contour lines on a navigational chart. When isobars are close together, a strong wind exists; when far apart, a light wind is blowing.

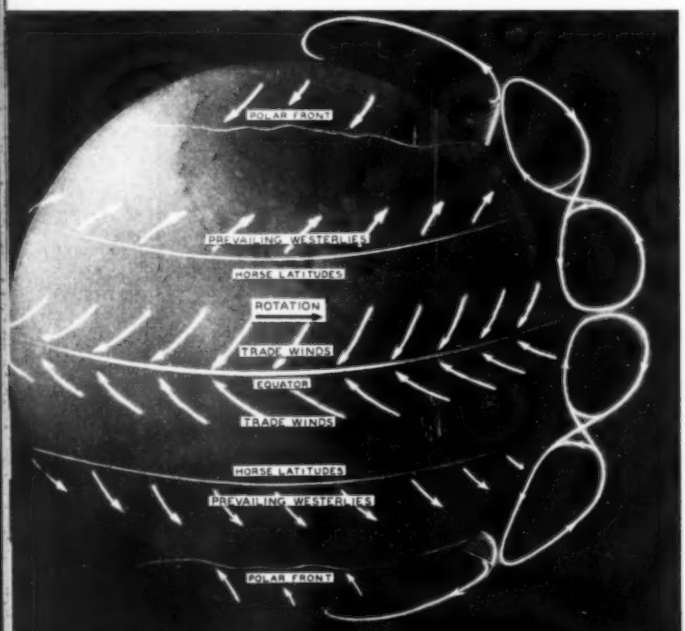
Air motion close to the ground is influenced by surface friction; its course is affected by mountains, buildings, etc. Wind at an altitude of 20 ft. above the ground is called the *surface* wind and it is this the pilot considers when taking off or landing. Its direction is determined by a *wind vane* (misnamed a *weather vane*) or *wind sock*, and its velocity by an *anemometer*. This latter instrument consists of a number of hemispherical cups mounted on a shaft which rotates and is attached to a tachometer calibrated in m.p.h. The faster the winds blow, the faster the cups turn the shaft and the greater the speed recorded. Actually the altitude at which wind vanes and anemometers are installed varies between 20 and 50 ft.



Isobars close together indicate a strong wind: far apart—light wind.



Winds blow from a high to a low. General circulation is shown below.



Wind velocities and directions are classified by a set of values known as the Beaufort scale. In this scale every wind group has a number and a wind arrow which is drawn on the weather map at the weather station. This scale is shown on page 105, and if you look closely at the reproductions of small sections of weather maps on this page, you will see arrows at the various stations. Arrows always fly with the wind. The tail lines or *barbs* on the Beaufort arrows are drawn only on one side of the arrow; they indicate the Beaufort number and therefore the velocity. One-half a barb means Beaufort No. 1; two and one-half barbs mean Beaufort No. 5, etc. Here is an easy scheme to follow in remembering

the velocity groups corresponding to the Beaufort numbers. For the numbers from 1 to 10, memorize the key numbers shown in the illustration. Each wind velocity group then can be determined simply by adding the key number to the preceding group velocity. For example: Beaufort No. 1 is 1 plus the Key No. 2; 1 to 3 m.p.h. Beaufort No. 2 is 4 plus the Key No. 3; 4 to 7 m.p.h. Beaufort No. 3 is 8 plus Key No. 4; 8 to 12 m.p.h., etc.

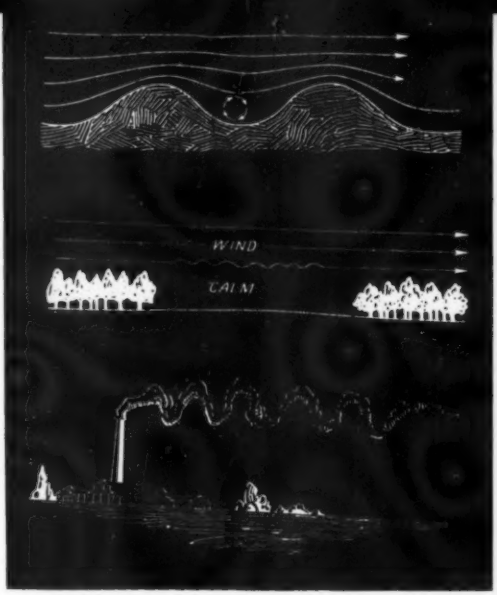
Wind at altitudes of between 1,500 and 2,000 ft. is called the *gradient* wind; it is free from surface friction and ground turbulence and follows a course determined for it by the rotation of the earth. We saw previously that wind blows from a high to a low. It does not blow straight across the isobars, however, except in case of surface wind; its flow is a combination of two motions, one its natural direction from high to low and the other a "twist" given it by the earth. The result is that air blows *counter-clockwise* out of a high and *clockwise* into a low. (See drawing on page 104.) This rule is true for the northern hemisphere of the earth, only; the reverse is true in the southern hemisphere.

A law, known as Buys Ballot's Law, states that *if you face the wind, the low pressure area will be on your right.* This can be said in other words. For example, with your back to the wind, the low pressure area will be on your left, *or,* when you fly directly into a low pressure area, the wind will blow from your left, etc.

With an increase in altitude up to the tropopause over the United States, winds increase in velocity, and the direction from which they blow shifts to the west; above 10,000 ft. they become the *prevailing westerlies.*

The general circulation of winds over the earth is complicated by its rotation. If the earth did not rotate on its axis, the warm air would rise to the tropopause at the equator, flow outward to the poles, cool and fall, and flow back to the equator over the surface of the earth. Actually, a series of circulations exists. The air flowing from the

[*Continued on page* 136]



Surface friction causes turbulence at low altitudes.

These are the instruments used for measuring wind.

BEAUFORT SCALE

No.	MAP ARROW	KEY No.	WIND VELOCITY M.P.H.
1		2	1—3
2		3	4—7
3		4	8—12
4		5	13—18
5		5	19—24
6		6	25—31
7		6	32—38
8		7	39—46
9		7	47—54
10		8	55—63

Beaufort scale classifies wind velocities. Barbs on arrows show number.

U. S. ARMY MEDIUM TANK

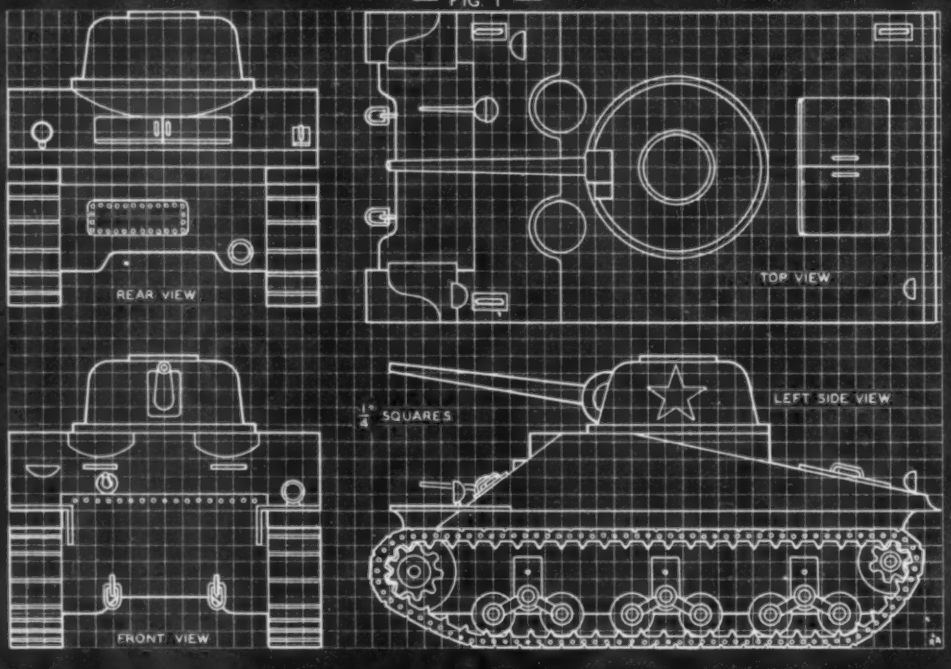
Make this wooden model of Uncle Sam's famous M-4, a 30-ton land battle-wagon.

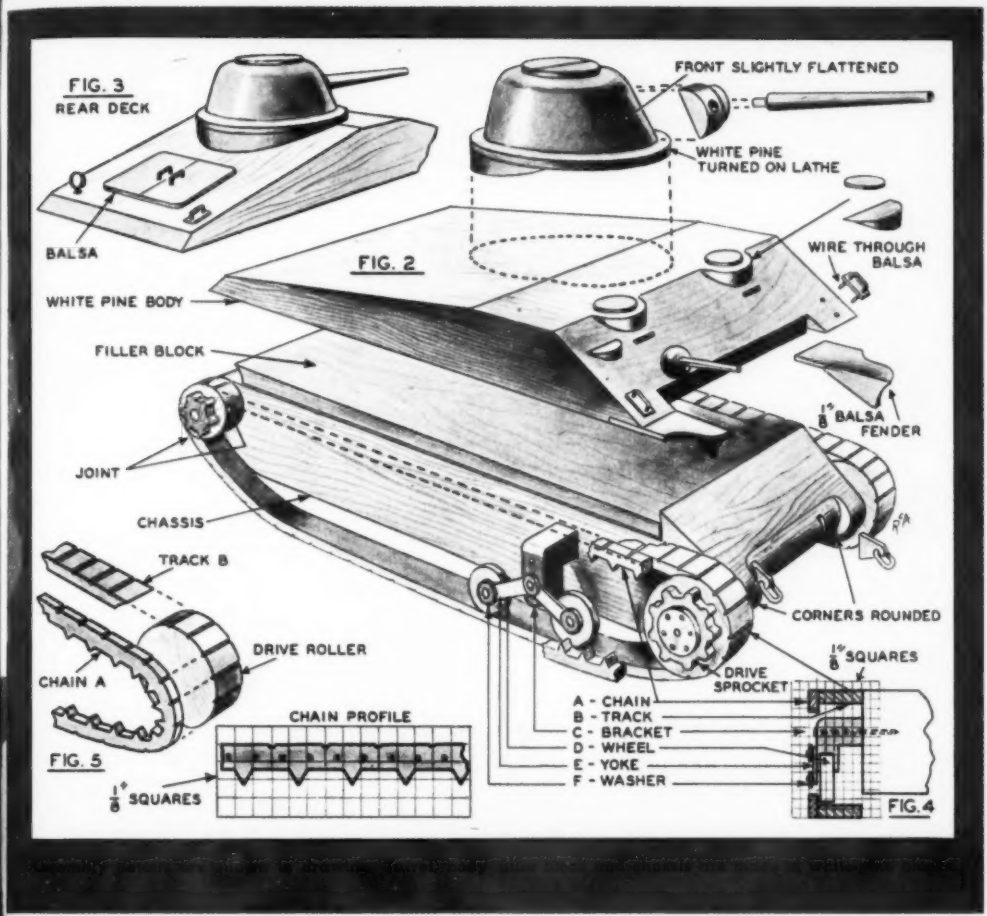
by Hi Sibley

OUR powerful M-4 General Sherman tank is making history on the battlefields of the world. Its 75-mm. cannon and numerous machine guns are blasting the enemy and proving the superiority of American machines and equipment over anything the Axis has to offer. The model described here follows closely the design of the M-4 but is not a scale or working version; there are no moving parts. This feature puts it within reach of every model-maker. White pine and balsa, a bit of wire and some brads or escutcheon nails are the only materials required for its construction.

Four views are shown in Fig. 1, and the assembly details are shown in Fig. 2. The turret, body, filler block and chassis are each

— FIG. 1 —





made of single white-pine blocks. The turret is lathe-turned with a flange at the base, and the front is slightly flattened to receive the gun mount. Manholes, consisting of flat disks of $\frac{1}{8}$" balsa, are mounted on the turret and sloping front of the body. Eye slits are scored; machine gun and hand grips are made as indicated. Short fenders of balsa extend out over the tracks and the fenders are mounted on these. The rear deck is shown in Fig. 3.

On the sides of the chassis block are attached the track assemblies. These are the most difficult part of the model and care must be used in their construction. To the front of the block are fastened two tow rings.

In building the tracks, first make drive rollers for each end of the unit. These are $\frac{5}{8}$" thick; the front roller is $1\frac{1}{4}$" in diameter and the rear roller is 1" in diameter. To them the track is fastened, two strips of the same width and $\frac{3}{16}$" thick (Fig. 4), one on top and the other on the bottom. The latter is scroll-sawed. Sprockets are attached to the rollers, and the chain is fitted over them and glued to the tracks. The chain, for simplicity, may be made in sections, two for the sprockets and one each for top and bottom sections. Assembly is shown in Fig. 5. Either white pine or balsa are good for the chain for they are easy to work, and there is quite a bit of hand-carving necessary. The material is only $\frac{1}{8}$-in. thick, however. After chain and track are glued together and sandpapered flush so that the joint is not visible, the surface is scored with a triangular file at points $\frac{3}{8}$" apart to form the treads.

Three pairs of idler wheels ride on the lower track, and are carried on yokes and brackets as shown in Fig. 2. Stud chain with brads to resemble bolt heads.

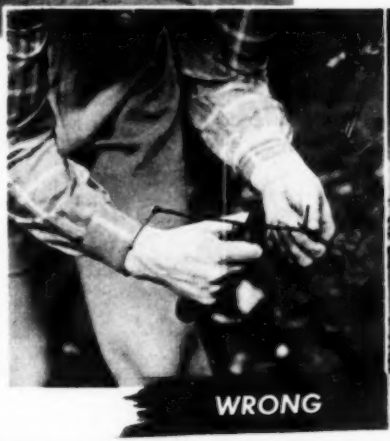
GARDEN TOOLS

Use them properly and save your back

PHOTOS BY CONSTANCE MITLER—GRAPHIC HOUSE

All the tools you'll need for working the average Victory garden are illustrated at left: Hand cultivators, hoes, spading fork and spade, steel and wooden rakes, wheelbarrow, wheel cultivator. The latter is a luxury hard to buy now, but you can easily make a satisfactory one (see page 111) if you like your gardening deluxe.

Right: Don't hack at a small branch with a sharp knife aimed at the second joint of your thumb. Pruning clippers do the job quickly and much more safely.



WRONG

RIGHT

Below: Have you ever been unexpectedly assaulted from behind by a mischievous steel rake, while strolling over the Victory sod? If so take heed, and don't curse the rake. Next time you leave it lying around place it teeth down instead of up!

WRONG

RIGHT

WRONG

RIGHT

Plenty of good exercise, as well as results, can be obtained from raking if properly done. Don't stand up straight with the rake held vertically and make mincing passes at the ground, for this will accomplish nothing beyond irritating the worms. Get the rake down low and really pull, with left leg relaxed.

Right: Unlike raking, wheelbarrowing should be done with the body fairly erect, arms at sides, to avoid back strain. The weight of the barrow (which can be regarded as a lever with fulcrum at axle) is thus suspended from the shoulders and parallel to the spine.

Below we see our heroine, Lambsy Divey, demonstrating painfully the quick route to a week in bed with a good dose of lumbago. Unless accustomed to walking on all fours, you'll find that method at lower right makes for more efficient digging and better exercise.

WRONG

RIGHT

LAWN ROLLER AND

by
Hi Sibley

No priorities needed for this roller and wheel cultivator

THERE are always uses for a garden roller —on the lawn, badminton or tennis court as well as in the Victory Garden. But try and buy one! Here are two types you can make yourself and they'll last indefinitely. They are of all-wood construction, filled with sand for weight.

In Fig. 1 the roller consists of two thick wood disks built up of three pieces each and assembled with casein glue and cleats on the inside. They are 12" in diameter and should be trued on a lathe, with a hole bored in the center to receive a wooden bar 1¼" in

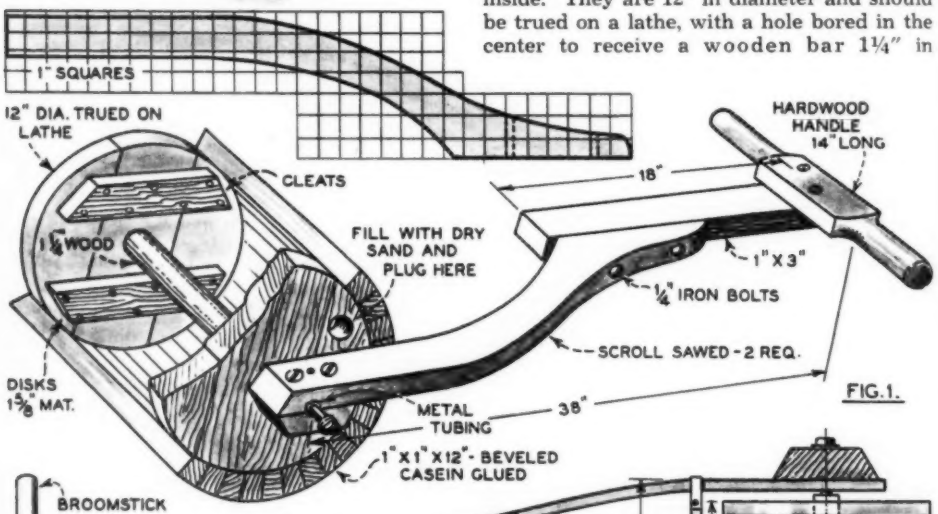


FIG. 1.

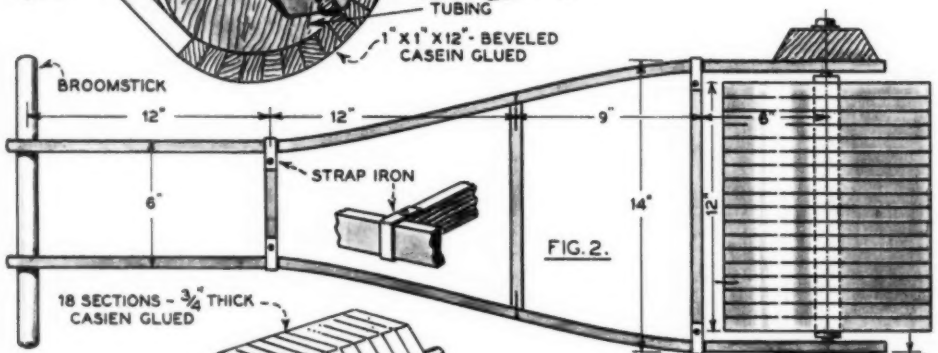
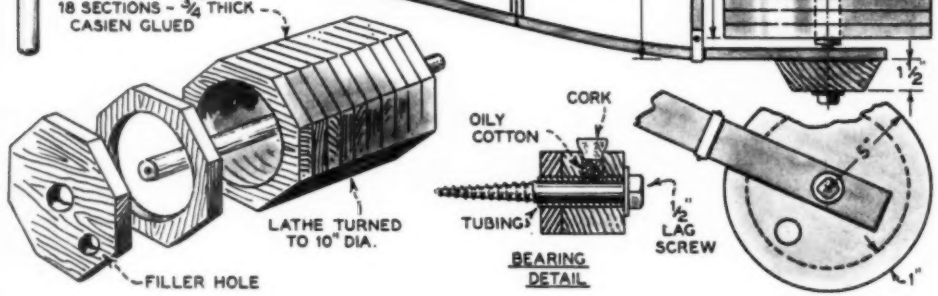
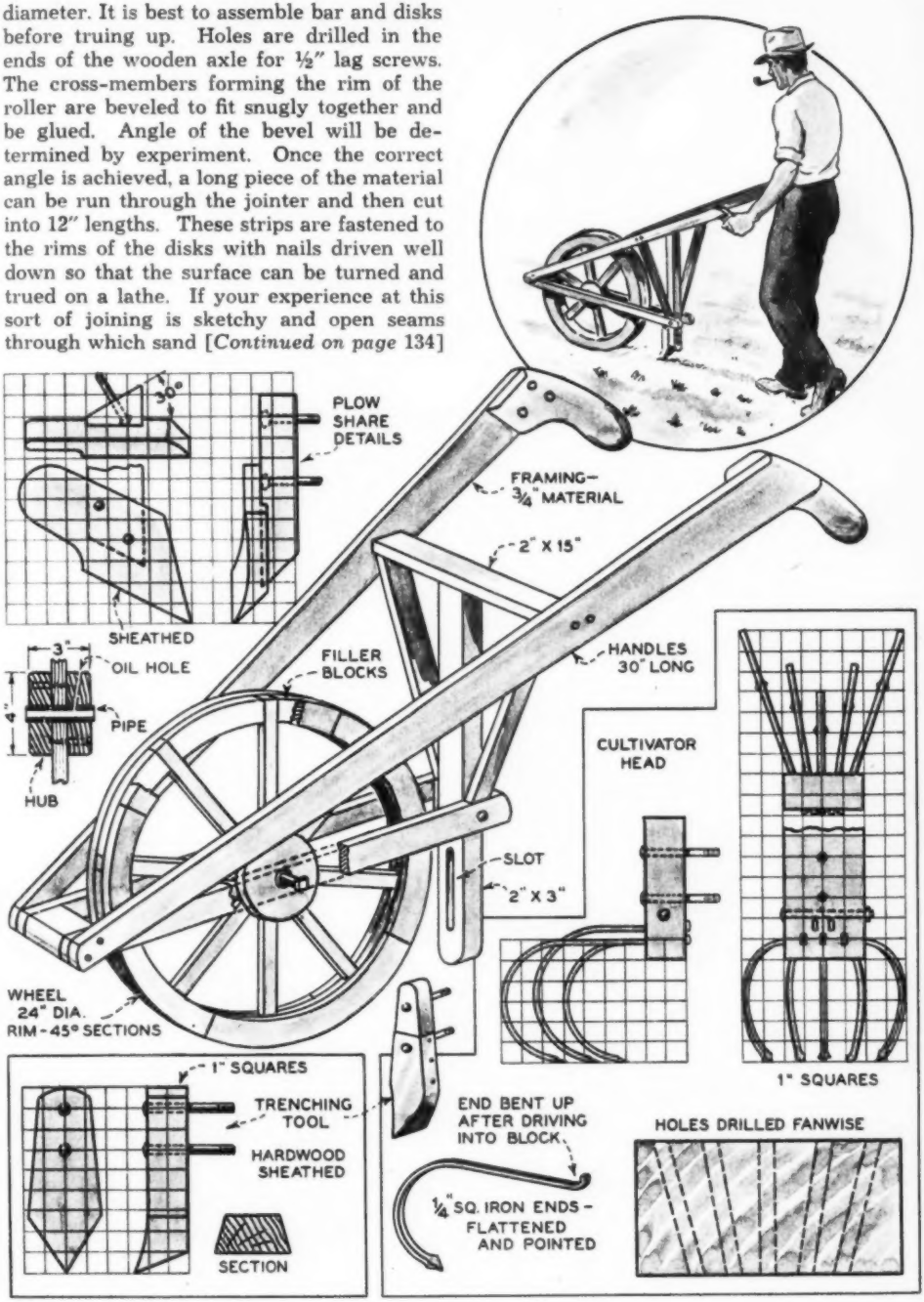


FIG. 2.



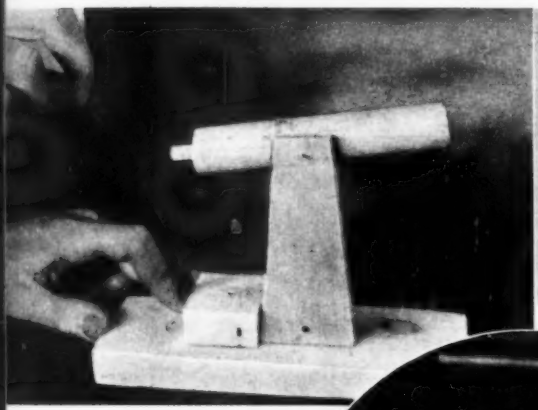
GARDEN EQUIPMENT

diameter. It is best to assemble bar and disks before truing up. Holes are drilled in the ends of the wooden axle for ½" lag screws. The cross-members forming the rim of the roller are beveled to fit snugly together and be glued. Angle of the bevel will be determined by experiment. Once the correct angle is achieved, a long piece of the material can be run through the jointer and then cut into 12" lengths. These strips are fastened to the rims of the disks with nails driven well down so that the surface can be turned and trued on a lathe. If your experience at this sort of joining is sketchy and open seams through which sand [*Continued on page* 134]

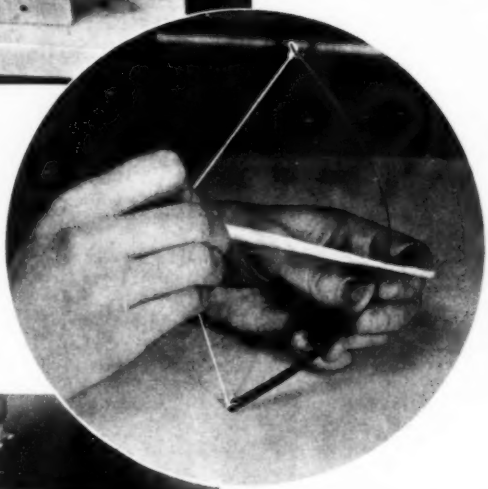


WORN HACKSAW BLADES *have many uses*

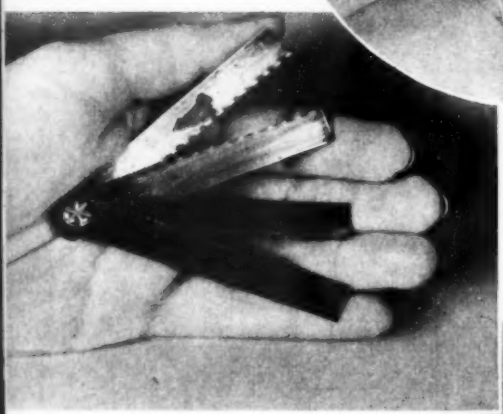
by Raymond F. Yates



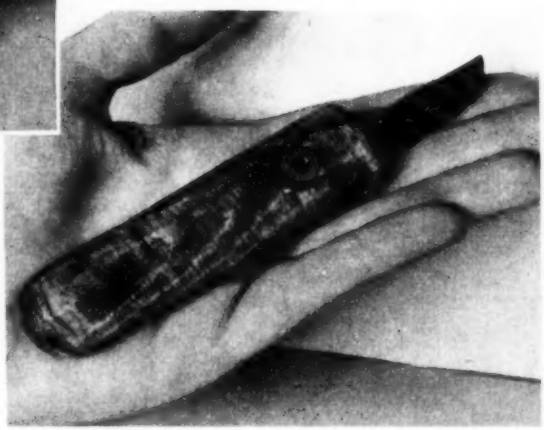
CATAPULT TOY: Old hacksaw blades have quite a bit of spring action, especially if too much load is not placed upon them. Here a half blade is mounted on a block and is used to shoot a wooden bullet through a gun which is formed by drilling a hole through ¾" dowel. File off teeth.



TOY BOW: The spring action of the blade may be used to make a small toy bow for the youngsters. A strong piece of cord is threaded through each end of the blade and pulled tight. If a light wooden arrow is used, the blade will be powerful enough to throw the arrow a considerable distance.

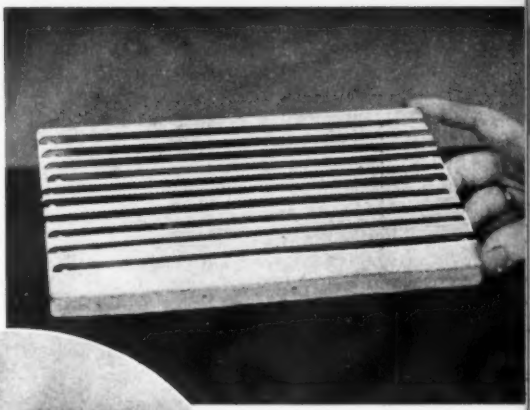


FEELER GAUGE: Most hacksaw blades are about .030" thick. They can be ground down to thicknesses of .010" or less by holding them on the side of a grinding wheel. So treated and checked with a micrometer, they make excellent, long-wearing feeler gauges.



KNIVES FOR MODEL BUILDERS: Once ground and honed, knives made from old blades will hold their edges for a surprisingly long time. Handles can be made for the knives from pieces of cherry or birch wood with a slot through their centers. A machine screw and knurled nut are used to hold each blade in place, the screw passing through the hole in the end. Various blade shapes for carving may be easily made.

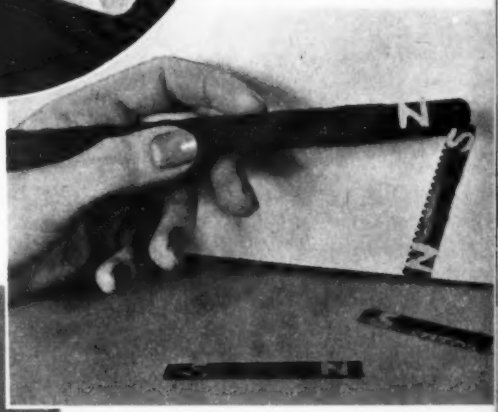
EVERY shop has a few worn-out or broken hacksaw blades lying around. Instead of throwing them out the next time you "clean house," convert them into some of the useful articles described here. Doubtless these will suggest additional uses to you. The blades are made of high-grade steel and make excellent scraping and cutting tools. When made into knives, they take an exceptionally sharp edge. Before using them in toys, remove teeth.

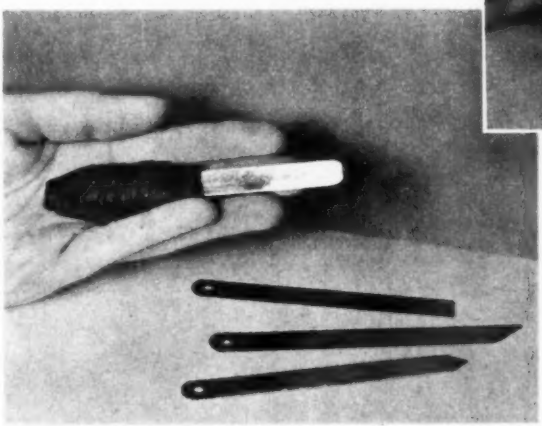


WOOD SCRAPER: When the edge of a blade is ground off square and the blade is mounted in a cherry or birch block as shown, a fine hand scraper for removing paint and varnish from wood surfaces is obtained. Make the slot in the handle slightly undersize so blade will have to be forced tightly in place.

SHOE SCRAPER: Eight or ten old blades mounted in slots cut in a pine board and placed outside the rear door will serve as an efficient shoe scraper. Cut the slots with a saw and insert two blades in each slot, forcing them in to anchor them securely. Allow approximately ¼-inch of each blade to project.

EXPERIMENTAL MAGNETS: Made from steel, hacksaw blades can be magnetized quite easily and will hold their magnetism for a long time. Powerful magnets can be made by binding five or six old blades with friction tape and rubbing on a D. C. electromagnet.



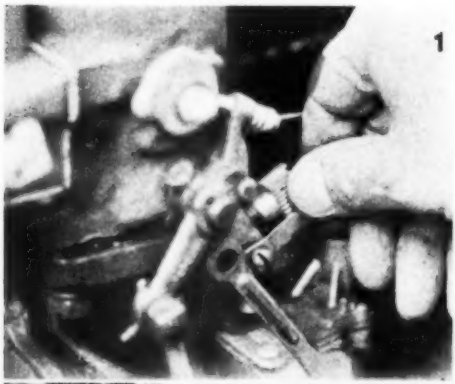


VARNISH REMOVER: When it is necessary to remove varnish from carved furniture for refinishing, a set of special tools such as these made from old blades will be invaluable. They may be ground very easily to different shapes to fit fluting, beading, etc. Separate handles may be made for them from cherry or birch wood, or friction tape may be wrapped around each blade end.

KEEP IT ROLLING!

by Frederick C. Russell

Your car needs careful attention, particularly during wartime. If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope to him at Mechanix Illustrated, 1501 Broadway, New York 18, N. Y., for a personal reply.



1

2

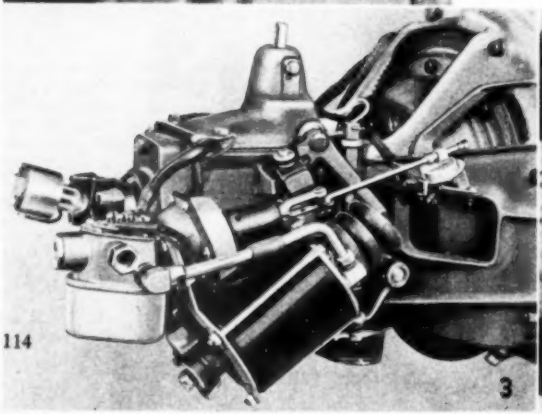
TRY IT!

NEXT time you do a carbon cleaning job be sure to smooth out any burrs with fine sandpaper. Unless this is done, new carbon will deposit more quickly. Scratches and nicks are spots in the cleaned surface which also attract fresh carbon. Aluminum pistons and cylinder heads are particularly likely to be scraped in the cleaning process. In other words, the smoother the parts the longer they will stay clean.

BREAKER POINTS that turn black and blue indicate a variety of possible conditions, including oil on the points and the wrong capacity condenser, but often the trouble is a plain hint that voltage is too high. Check for poor connections, a frayed ground strap, excessive generator output and a sulphated battery.

"CARBURETOR FRIGHT," while a good thing to keep tinkerers out of mischief, isn't anything that should bother any motorist who follows simple directions (photo 1). Don't adjust mixture until the engine is normally warm. Turning the idling screw IN leans the mixture, turning OUT enriches it. Then IN until the engine tends to stall; then OUT until it runs smoothly. A quarter turn one way or the other may be needed to check stalling or backfiring. If the carburetor has two idling adjustments give each exactly the same number of turns OUT from the closed position. Modern carburetors have no high speed jet adjustments.

DON'T BLAME L. N. S. for asking why it is necessary to have an extra nozzle or jet above the throttle for idling. You'd think with the throttle practically closed enough



3

4

gas still could be sucked up from the carburetor, but in practice there isn't enough vacuum on the carburetor side. Meanwhile on the manifold side of the throttle there's high vacuum, more than enough to draw a direct supply from the float chamber to the idling jet.

FEWER SQUEAKS per mile, tighter doors and a curb on rattles are certain to be your reward for spending a little time pressing out the rubber bumpers on your car's doors. These blocks flatten down with service and, if not replaced, they should be backed up with a wedge of rubber, wood or even cardboard. A little wedging is sufficient. (Photo 2.)

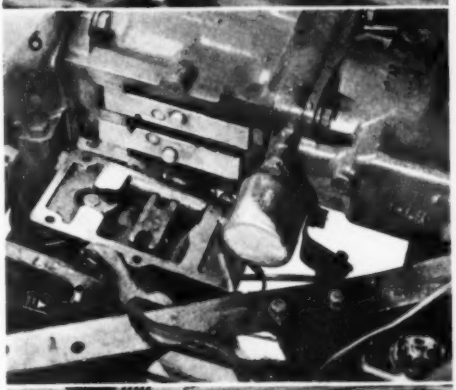
TAPPETS THAT TAP are so common it's easy to make the mistake of assuming that every tapping sound in the engine means a faulty tappet, too much clearance or a sticky valve. Don't forget that a likely cause of the trouble is a bad seating valve due, in turn, to the engine block being warped. This can be corrected by a special valve grinding job in which valve seats are recut to permit seats and valve heads to be in the same plane.

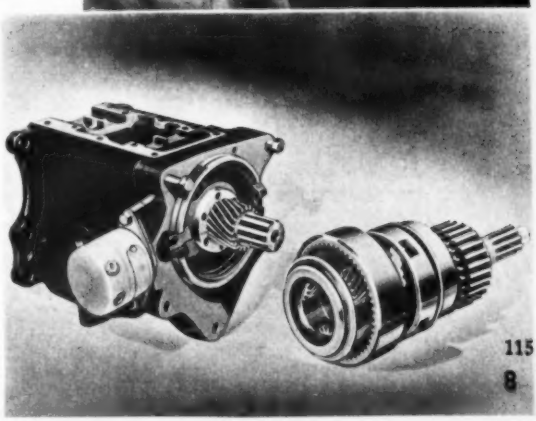
NEW MUFFLERS are not difficult to get but often the clamp that comes with the replacement kit isn't as good as the original. One reader found the new clamp squeezed the muffler flange in such a way that the exhaust pipe end was not uniformly tight. Wisely having saved the old clamp he discovered it was of a special type that squeezed evenly all around. This one made a good fit and a tight seal.

FOR THE BENEFIT of those who drive Hudsons with the well-remembered Electric-Hand gear shifting device I am offering the accompanying view (photo 3) of the unit, including the booster cylinder to operate the clutch. At this time most of the trouble owners are likely to experience with this device would be due to loose connections and worn wiring.

WOULD YOU BE BAFFLED if the car refused to run even though the engine operated normally? Here, then, are some of the things that would account for failure to get rear wheel action, motor running, clutch engaged and gears in mesh:

The clutch may slip or the gear shift forks may be broken. A broken rear axle or a sheared key would also prevent motion. A locked brake is another [*Continued on page* 140]





COTTON KAYAK

by Hi Sibley

WARTIME shortages should not prevent you from having that light kayak you've wanted because plenty of material is available for the framework, and if you cannot find any light duck for the "skin" you can use unbleached muslin. This will be satisfactory for a season or two until you can obtain heavier material.

As dimensioned here the canoe is junior

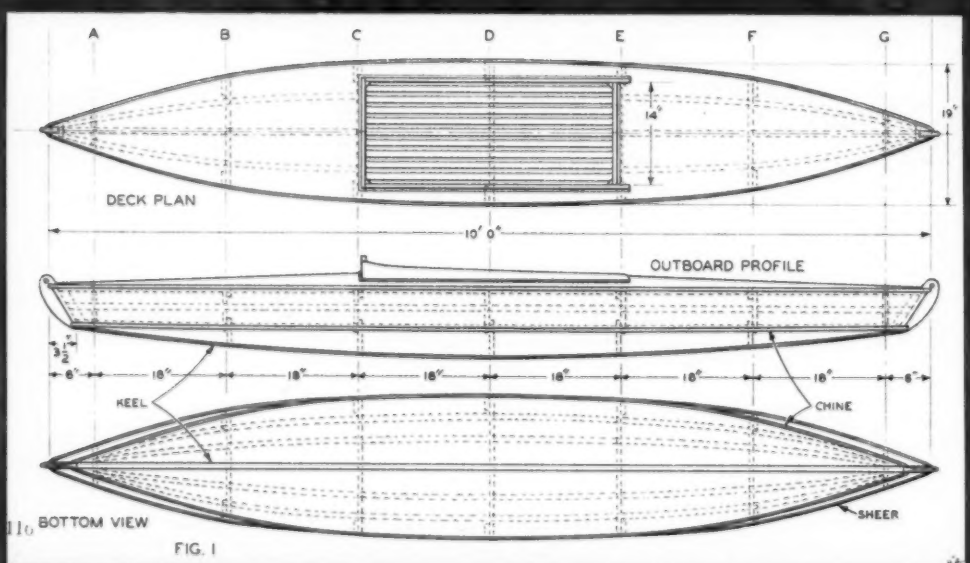
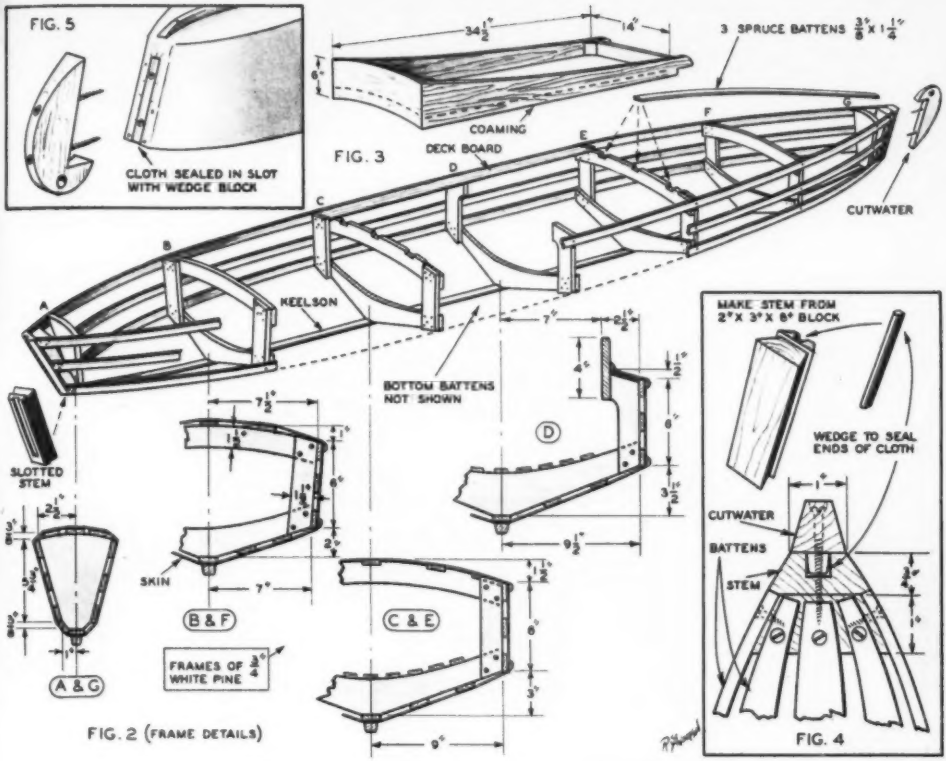


FIG. 1



General construction details. Kayak is designed for muslin covering if suitable canvas cannot be obtained.

size, or 10′ long. By lengthening it two frames, or 36″ amidships, it will serve an adult. Deck plan, outboard profile and bottom views are shown in Fig. 1. Note that there are three battens on the deck and five, including keel and keelson, on the bottom. The frames are evenly spaced and in identical pairs except the central one, greatly simplifying construction.

Build the frames first, as shown in Fig. 2. White pine is preferred because of its lightness, but any other available lumber can be used instead. End frames A and G are single pieces of ¾″ material, while B, C, E and F are made up of four pieces screwed together. Note that the battens lie on top of A, B, F and G, but are notched into C and E. Frame D, in the middle of the cockpit, is built of three pieces and supports the coaming as well as deck boards on each side.

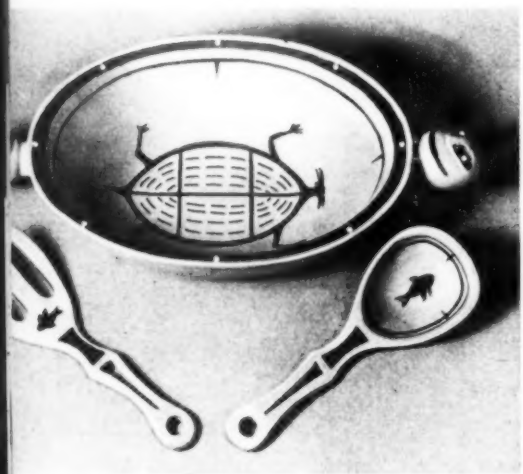
General assembly is shown in Fig. 3. Spruce battens are recommended, though pine or fir may be used instead, and all are of the same cross-section. The rectangular coaming is designed for the simplest construction, triangular cleats casein-glued in each corner. Make the stem from a block of white pine 2″x3″x8″. It is rabbetted at each end and on the sides for the battens, and is installed at an angle of 30° with the vertical. Stern post is identical with the stem. The front face of the stem is 1″ wide, and has a ⅜″x½″ deep slot running from the top to ½″ from the bottom. A wedge block of hardwood is made to fit loosely, so that when driven in over the ends of the skin fabric to seal them, it will be snug without splitting the stem piece, Fig. 4.

In assembling the frames screw them to the keelson first, and make sure that they are all at right-angles to it. Then install the sheer battens, following with the chine and other battens, deck and bottom.

The frame is turned upside down for applying the skin fabric. Marine glue should be applied to the keelson, sheer battens and stem and stern. One piece of fabric covers bottom and sides, and should be tacked along the keelson at [*Continued on page* 138]

Eskimo Salad Set

THIS salad set is inspired by a bowl and ladle designed more than half a century ago by Eskimo craftsmen. The ball handles are carved to resemble grotesque human heads, while the painted decorations of mythical animal and fishes, and inlays of white glass beads on the bowl combine to make a project that is truly unique.

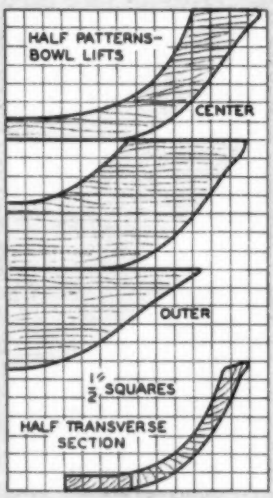


Here is the completed set. Designs are lacquered.

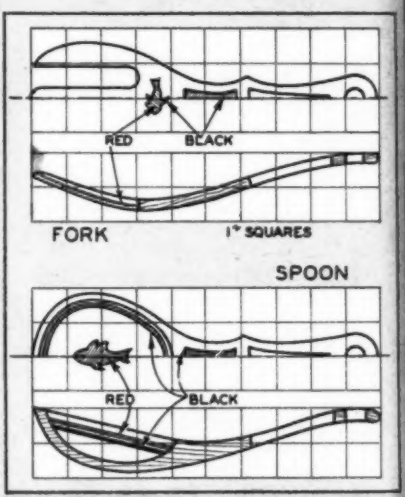
The original Eskimo bowl was carved from a single block of wood. If such a block is obtainable, use it and finish it in natural color. However, much labor is saved and a more dependable result assured if the blank is glued up from several pieces. Make paper patterns for the sections or "lifts" by sketching through ½" squares. Cut them out and nest them together for band sawing from 2" by 4" stock. Glue six pieces together, preferably with waterproof plastic adhesive.

When the blank is dry, band saw the elliptical outline and knock off the corners of the lifts with a chisel and mallet. Instead of finishing one side at a time, work over the entire bowl, for it is easier to obtain symmetry by this method. Cut two cardboard templates, one to check the end profiles and one for the sides. If a band sander is available, slack off the sandpaper belt and use it "soft" for working down the contour. Pieces of broken glass are effective scrapers for this job, also.

One of the photographs illustrates a rapid method of hollowing the bowl. Clamp a gable-shaped block to the table of a drill press and chuck an auger bit with the point cut off. Adjust the stop to prevent the bit from approaching closer than ⅝" to the block. Rough the inside by resting the bowl on the block



The blank for the bowl is glued up from a number of pieces. Spoon and fork are cut with band saw; make openings last.

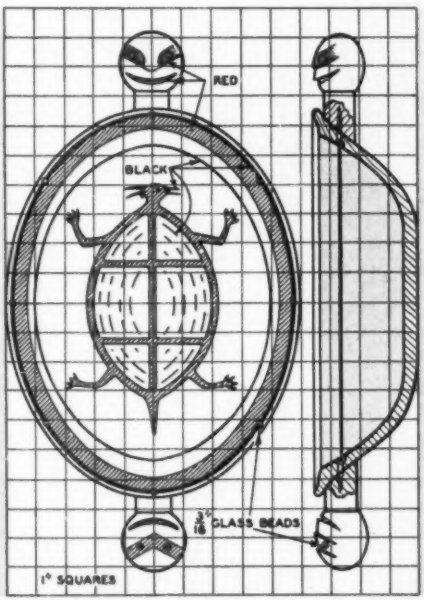


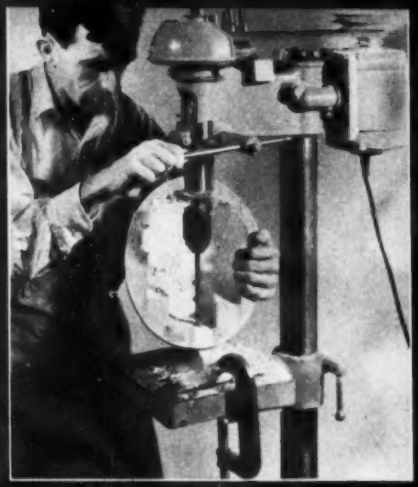
and boring from various angles. Gouge the surface and bring true by scraping and sanding.

To make the spoon and the fork, draw the outlines on one face and one edge of each. Scroll-saw the openings and cut the outlines with a band saw. Nail the scraps back in place with nails in the waste wood where the blade cannot strike them, and stand the pieces on edge for cutting to thickness. Little labor is required to complete the spoon and fork.

Turn the handles from one piece of wood, cutting them apart after sanding. To fit them to the bowl, cut the necks obliquely and attach them with screws from the inside of the bowl. Align them with wedges and scribe around the joints with a pencil. Remove and trim the neck ends to the lines.

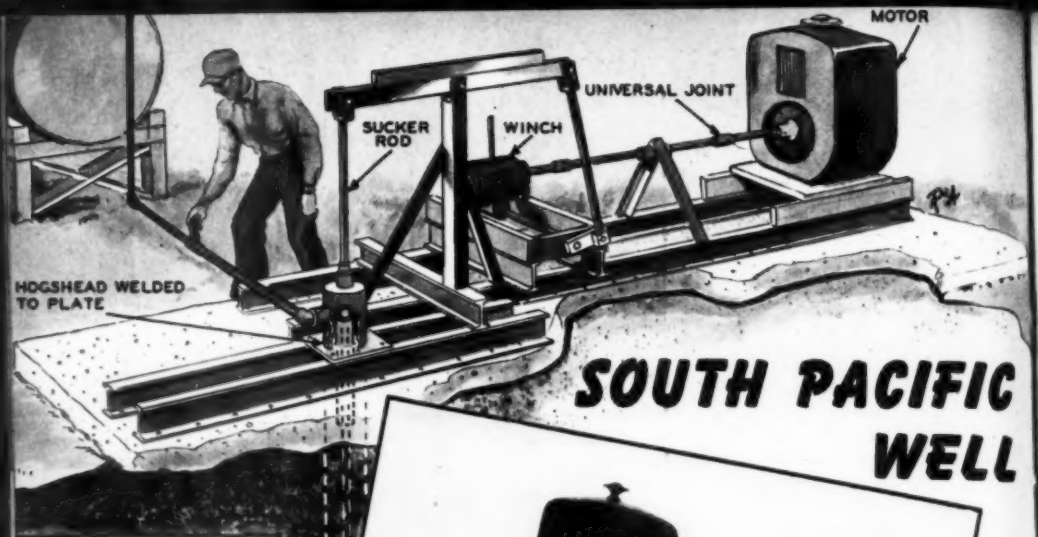
Sketch the faces on the handles and use a half-round cabinet file to score the mouths and the long lines of the eyes. The rest of the features are whittled with a knife or chisel, smoothed with the file, and sanded. Extreme accuracy is not required, for a limited amount of irregularity fits the character of the project. This also applies to the decorations. Glue and screw the handles [*Continued on page* 140]



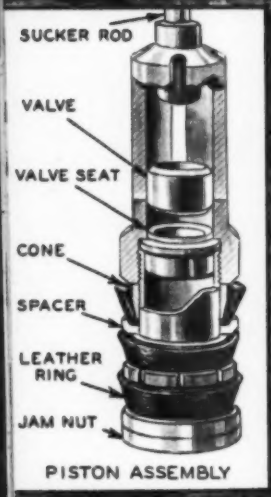


Don't use bit at high speed when making bowl.

Plastic beads can be turned on lathe if glass ones aren't available. Make from crochet hook.



SOUTH PACIFIC WELL



WITH typical American ingenuity, Marine Gunnery Sergeant E. C. Wickstrom, formerly of Minnesota and now somewhere in the South Pacific, solved the water supply problem for his outfit with this Rube Goldberg invention. It's a deep-water pump and filter system built of junk-pile parts by means of a mobile machine shop. Water for drinking, cooking and washing formerly was taken from the sea, then distilled and rationed, but now this well, pumping from 55′ below the surface, supplies 20,000 gallons a day for the price of 10 gallons of gas.

Seabees dug the well at a spot he designated, and in exchange, he built them two handmade suction cylinders for their own wells. Like his own mechanism, they were made from scrap.

He obtained 350′ [*Continued on page* 142]

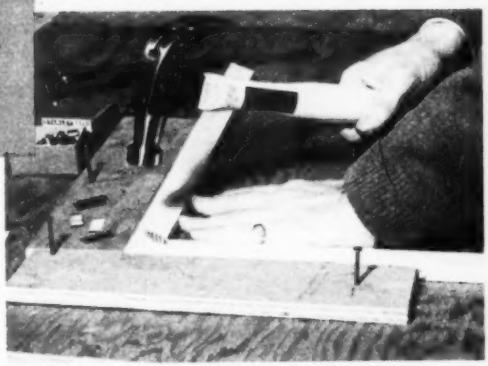
Rubber band around nails locks frame in place.

ENLARGING EASEL
FOR SALON PRINTS

THE standard size for salon prints is 14″x17″, but have you tried to find an enlarging easel that will take prints of this size? You have to push your adjustable easel to its limits to take 11″x14″; larger ones are out of the question. This easel you can build in a couple of hours and it'll cost you less than a dollar.

Make a rectangular frame with inside dimensions ½″ less than the print size. Use strips of ½″x1¼″ wood. The corners are mitered and joined with corrugated fasteners. The base of your easel is a piece of plywood cut to the outside dimensions of the frame, and the latter is attached to the base with two small hinges. Use small nails in base for paper stops, drilling holes in the frame to permit closing.

To hold down the frame after the paper has been placed in position, use the nail and rubber band arrangement shown in the insert at top of the page.



Frame corners are mitered and fastened as above. Small nails in base serve as stops for the paper.

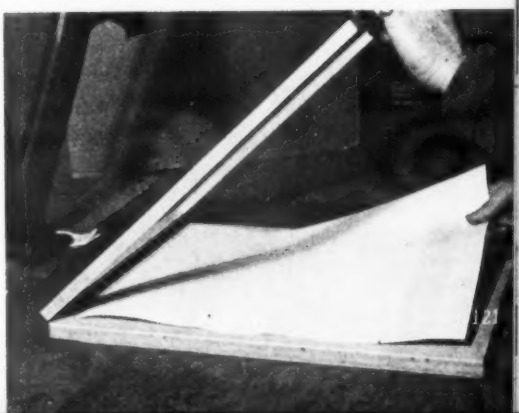


PHOTO CONTEST

FIRST PRIZE ($10.00): .OOmpah Duet, by Eva Luoma of Hollidays Cove, W. Va.: taken with a Speed Graphic. SECOND PRIZE ($5.00): With Liberty And Justice For All, by Sylvia Hoffman of Los Angeles, Cal.: taken with a Graflex. THIRD PRIZE ($4.00): Young Sparrows, by E. J. Eisenmeier of Baltimore, Md. FOURTH PRIZE ($3.00): Resting Blades, by G. L. Osmanson of Morris, Ill.

1st PRIZE

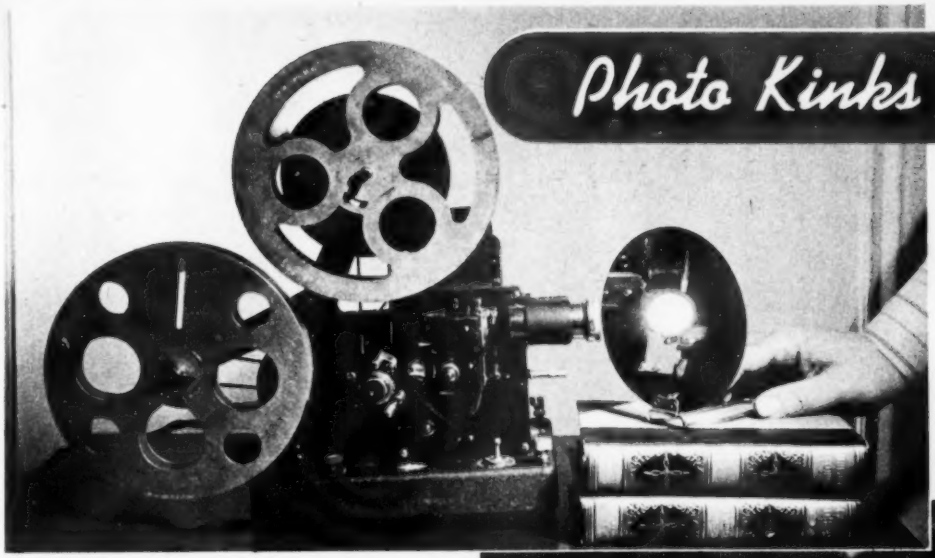
2nd PRIZE

3rd PRIZE

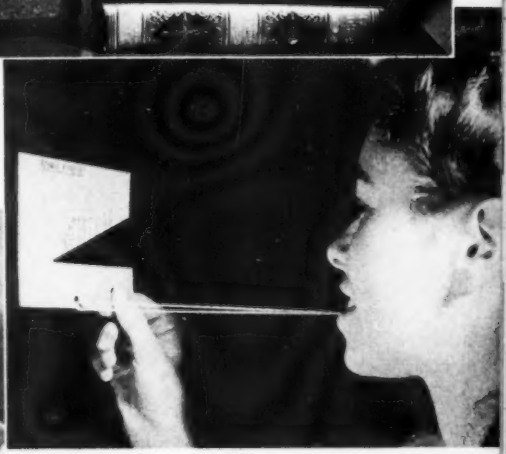
Submit contest prints unmounted—no larger than 8x10 inches. With each print list camera, film, lens opening and shutter speed, illumination and developer. Write your NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. ENCLOSE POSTAGE for the return of unused prints. Published prints cannot be returned. Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, New York.

4th PRIZE

Photo Kinks



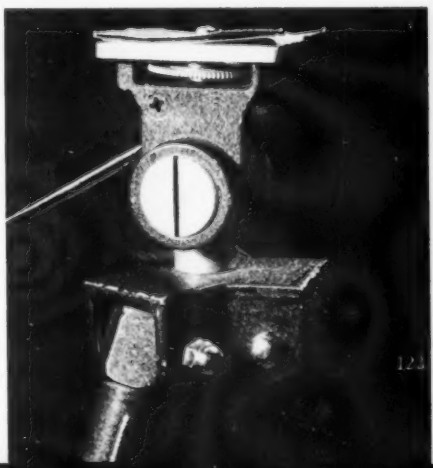
REVERSED MOVIES: Sometimes rented reels of movies are wound backwards, causing reversed images. Mirror set before projector straightens them out without rewinding; reflected images are in correct position.

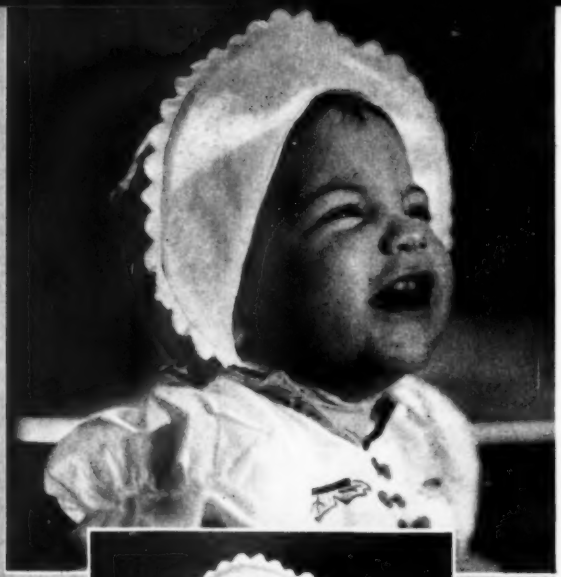


RANGE FINDER: Cut an angle in a square of cardboard, use 8" string to assure constant distance from eye, and calibrate scale by sighting in the angle on object 6' tall at various distances.

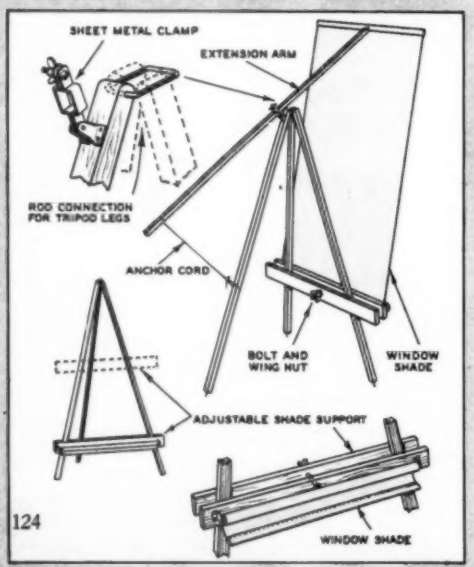
NEGATIVE FILE: Cans containing rolls of 35-mm. film can be stored conveniently in egg cartons which have compartments to hold a dozen eggs. Paste contents label on lid to identify pictures for future reference.

TRIPOD BUSHING: When your tripod screw is too long for the camera thread, a paper match cover can be used as an emergency bushing. Insert between the base of the tripod and camera to take up space.





Reflector improved pic above. Construction is below.



Lighten Those Shadows

A reflecting unit made from a window shade does the trick.

by Louis Hochman

A STRANGE thing about most of us photographers is that we'll go to a great deal of trouble arranging the back, side and front lighting of our indoor portraits, but when it comes to outdoor shots, we'll leave the entire lighting problem to old Sol. Of course we'll place our subject so that the rays give us the most pleasant effect, but in strong sunlight we never can avoid entirely those harsh, undesirable shadows.

Flash equipment can be used to lighten those shadows, or you can take along with you some light-colored surfaces to serve as reflectors. In a pinch, you can even use a large newspaper! Sheets of white paper, laid out and glued to a large cardboard base, will serve as a handy reflecting unit also. A white enamel table top is ideal but heavy, and if you are a home movie fan, don't overlook the possibilities of your beaded screen. For the highest efficiency in reflecting surfaces, sheets of tinfoil stretched over a cardboard base are hard to beat.

Another solution is to use white window shades, which make swell reflectors; they can be fitted to easily constructed, collapsible stands as shown here. The stand permits easy adjustment of the shade to the angle desired, and can be folded flat for convenient transportation.

To make the stand, take three 4½′ lengths of ¾″ wood, and connect them at the top to form a tripod. A simple way to do this is shown in the diagram. Round the ends and drill ⅛″ holes through them. Then, arranging them in position, pass a length of ⅛″ rod through the holes, bending it to form a square as it passes through each leg, and then solder the ends together where they meet. This will permit the

This is reflector in use. Variety of adjustments are possible.

two front legs to swing out from each other sideways, and the rear leg to swing away backwards.

Make an adjustable crosspiece to hold the window shade by connecting two 3′ lengths of 1″ wood loosely, with a single 2½″ bolt and wing nut passed through their centers. This crosspiece is attached to the tripod stand by clamping its two parallel parts over the two front legs of the stand and tightening it in place with the wing nut. The window shade can be attached to the outer crosspiece by means of window-shade brackets, obtainable at hardware [*Continued on page* 134]

Too many bad shadows in this picture.

Reflector has lightened them here.

This is a natural expression: pleasant, we'd say.

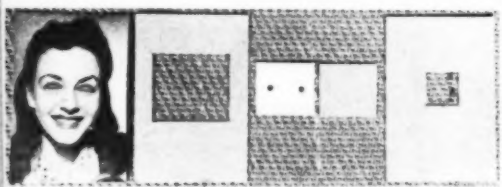
Now she's starting to roll those eyes. Watch out!

"Those FLIRTY, FLIRTY eyes"

Here's a paper dolly you can call your own—a photographic one. You'll like her!

ARE you one of those photographers who feels that there isn't enough life in his pictures? This little trick will put life in them—so much, in fact, that you'll gasp the first time you see it in action! Try it with a picture of your sweetheart.

Take two front-face portraits, one with a natural expression and the other with the eyes wide open so that the whites show on all sides of the eye. Make these pics the same size. Then carefully cut out the eyes from the second picture and mount them on a piece of pure white paper, spacing them to correspond with the eyes on the natural portrait. Mount this paper on a rectangular piece of cardboard as shown. Next cut out the eyes from the portrait, working very carefully with a sharp razor blade. Take two pieces of cardboard the same size as this picture and in one cut a rectangular opening somewhat larger than



Here are the parts: portrait, frames and eye piece

This is a rear view, showing how to hold the photo and place the finger on eye piece through back slot.

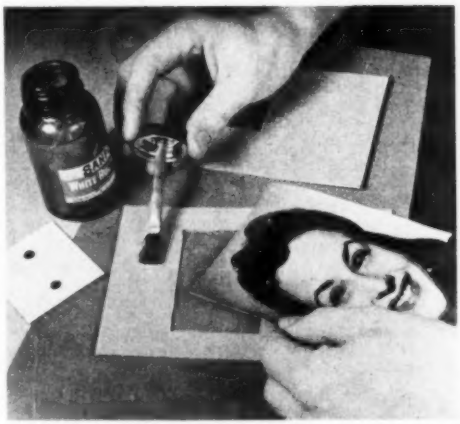
Make her flirt by moving the eyes with your finger.

Two portraits are needed. Eyes are cut from one.

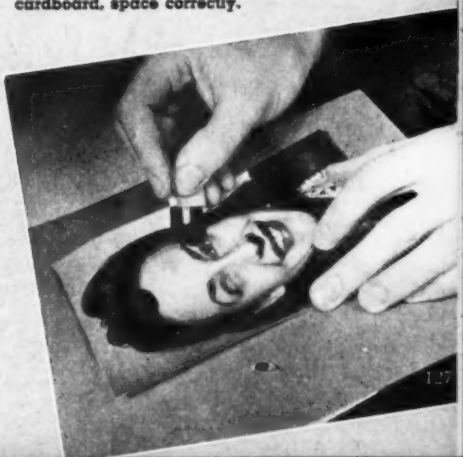
Mount eyes on paper and cardboard, space correctly.

the piece upon which the eyes have been mounted. In the other cut a smaller opening.

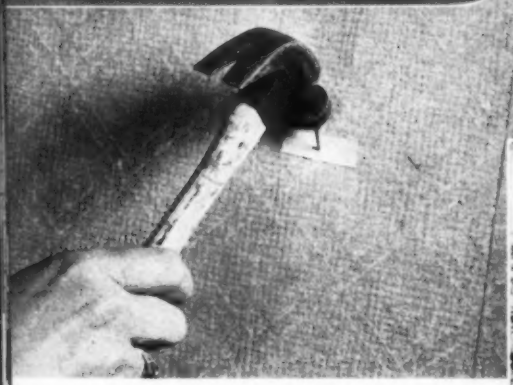
Assemble by gluing the cardboard with the large opening to the back of the print, placing the eye piece in the rectangular slot and then gluing on the back with the small opening. Grasp the picture as shown in the photographs, placing the forefinger on the eye piece through this opening. Move the eyes back and forth, up and down by moving your finger. Startling effects can be obtained with practice.



Cut eyes from natural portrait as at right. Assemble pieces as above. Eyes move in slot in center frame.



Home Aids

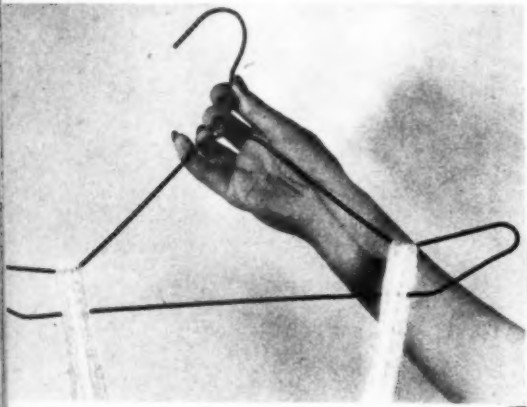


Nails In Plaster

WHEN driving nails in the wall to hang pictures, first put a small piece of adhesive tape over each spot where a hole is to be made. Nailing through this tape will prevent the plaster from cracking. The pictures will conceal the strips and so they may be left in place.

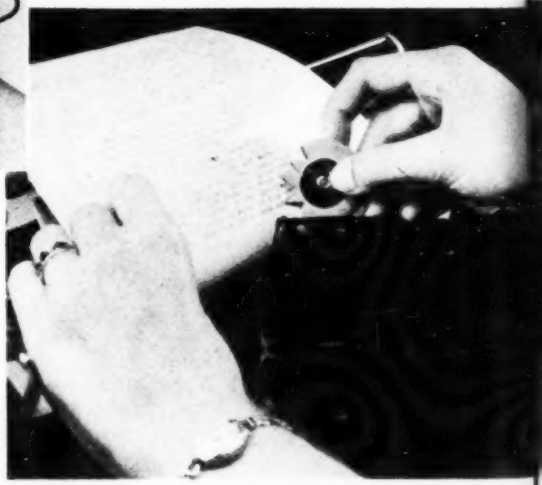
For A Double Boiler

SOMETIMES water in the bottom of a double boiler will boil away completely without warning, resulting in damage to the pot. This can be avoided if an ordinary jar lid is placed in the water compartment: when the water gets low, the lid will rattle and warn the housewife to refill.



Improving Hangers

THE female members of the household will appreciate this one! Sleeveless garments are difficult to hang on an ordinary hanger because of their tendency to slide off and fall to the floor, but if the ends of wire hangers are bent as shown, the problem will be solved.



Notched Eraser For Single Letters

IT IS difficult to erase single letters or characters with the regular typewriter eraser, but if a few notches are cut in the sides as shown, one of the points can be used to erase any desired letter.

Victory Place Card

THE V of this place card is cut from cardboard, and crepe paper in class colors is pasted on the arms. Letters for the year are inked on, also. Scroll is attached with glue and ribbon is held with sealing wax. Bend back the lower ¼" to hold card upright.

Ice Cubes For Plants

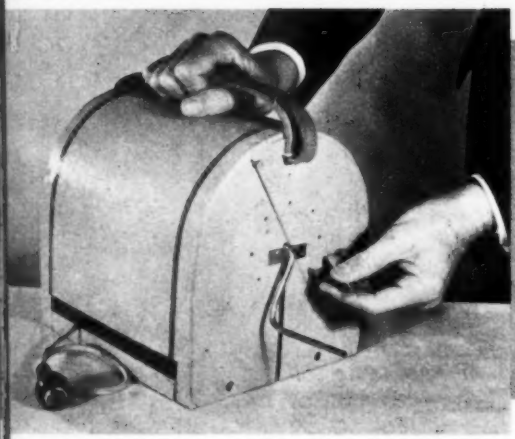
PLANTS in hanging flowerpots in hard-to-reach places can be watered quite easily by means of a few ice cubes dropped on the earth away from the plant stem. The cubes will melt and the soil will absorb the water. With this method overflow will be avoided.

Paint Stirring Rod

A GLASS stirrer of the type used in mixing drinks, also comes in handy for mixing small cans of paint. The glass is better than a wooden stick because it can be used repeatedly, the paint wiping off quite easily. Stirrers may be obtained in any 5-and-10.

Lemon Eliminates Onion Tears

MOST housewives look upon the job of peeling onions as a very disagreeable one because of the tears which the onions cause. Running your peeling knife through a lemon will stop the tears.



Electric CALL BELL

by Charles & Bertram Brownold

Call box is at left. Peg keeps crank from turning.

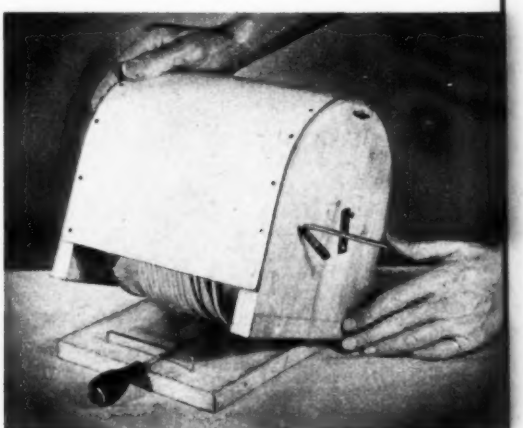
YOU'LL appreciate this little device if there is a sick person or invalid in your home, or if you have small children who might demand attention after they have been tucked in for the night, the bell or buzzer can be carried to any room you may happen to be in, and it is wired to a push button at the bedside.

Its construction is as follows: the bell and the battery are fastened to the sides of a piece of board just large enough to fit snugly into a tin can of suitable size. Bell and battery are wired together through a hole bored in the board. The wire is then passed out of the can through a hole in its side and is coiled around the can which acts as the drum of a winch.

The battery is fastened to the board by a metal strap secured by round-head screws and washers, but before the bell and the battery are screwed in place, a crank made of light metal rod is secured to the board by means of wire staples driven through the wood and clinched on the other side. To prevent the rod from slipping or turning in the staples, a U must be bent into it before it is put in place. The U lies flat on the board. The other end of the rod (not the crank end) is thrust through a hole centered in the can's bottom. The board is held in place by screws through the sides of the can, and it must be so placed that the rod is centered through the can.

The assembly is housed in a box with bottom and sides of wood and top of wall board light enough to bend around the curve. Slots in the wooden sides, just wide enough to accommodate the [*Continued on page* 134]

Battery, bell and crank assembly fit inside the can.



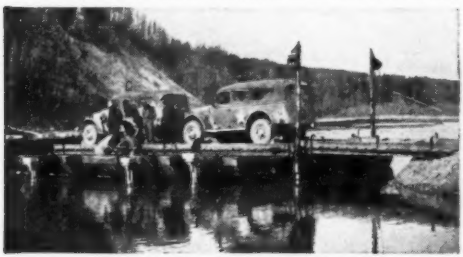
Box is wooden with wall-board top. Note wire guide.

"What would the Ar-my do with-out the En-gi-neers?" pops the $64 question in "Song of the Engineers". A hard one to answer! Wherever the Army advances, in tropic jungle or Arctic outpost, the Engineers are out in front preparing the way . . . building air fields . . . throwing bridges across broad rivers . . . constructing highways over formidable mountains . . . resourcefully transforming "impossible" assignments into routine tasks.

Speed is a vital factor with the Engineers, and outboard motors have proved highly useful in ferrying and bridging operations. The Evinrude above, fresh from its packing case, will soon know what it is to "get the works" from the hard-working Engineers.

1 **Mounted on the stern** of a standard Engineers' ponton, (the Army term is *ponton*, not "pontoon"), this Evinrude makes fast work of transporting bridge material. It takes *stamina* as well as power to deliver the goods in this kind of service!

2 **Ferries built quickly** — here's how the Engineers do it! Several pontons are decked together with standard bridge material and, with motors mounted, the ferry is ready! Here 3 Evinrudes do a "triple screw" job pushing a truck up stream.



3 **Ready to go** with another load. Such service is not as spectacular as that performed by the great Evinrudes that drive the Engineers' speedy Storm Boats, but it's as important — and it may have to be performed under battle conditions!

4 **After Victory** there will be thrilling new Evinrudes for all to enjoy! Today it is *our* job to deliver to our fighting forces the finest motors that all our skill and long experience can build! EVINRUDE MOTORS, Milwaukee, Wisconsin

EVERY DOLLAR YOU INVEST HELPS SPEED VICTORY . . . BUY MORE WAR BONDS

Bearings For Victory

[*Continued from page 87*]

The roller, like the ball, revolves between races. In certain cases the races are tapered, the inner race being a truncated cone having a parallel base and top while the outer race is a steel collar tapered to conform. Such a tapered roller bearing can accept both radial and thrust loads and if the bearing is a multiple-tapered roller bearing, the thrusts can come from either direction. The multiple bearing has two sets of rollers revolving on two truncated cones having a common base.

In addition to race members, the roller bearings have cages or separators just as have the ball-bearing assemblies. The roller-bearing cages have the same duties to perform as have the ball cages plus an additional one; they must keep the axes of rotation of the rollers parallel with each other and with the shaft about which the whole assembly revolves. If the axis of any roller were to get out of line, it would cause the very friction which the unit was designed to overcome.

Roller bearings range in size from giants with an overall diameter of 4' and weighing many hundreds of pounds, down to tiny bearings the diameter of which for the entire assembly is a small fraction of an inch. The small roller bearings are called needle bearings because their fine steel rollers resemble needles. Needle bearings are always the full type; that is, they have no cages.

An interesting phase of the ball-bearing industry is the manufacture of so-called miniature bearings. These are complete ball-bearing assemblies including race members (but frequently minus cages) so minute that they have been used successfully in pocket watches. The bearings in a watch usually are stationary bearings, some of which are of the sleeve or bushing type and are cut from sapphire, ruby and garnet. Hence they are called the "jewels" of the watch. Their hardness makes for long wear, and the smoothness to which they are polished minimizes the friction from the parts that either rotate or oscillate upon them. The miniature ball bearings (and remember, when we say "bearing" we always refer to the whole assembly and not to the balls alone) are so tiny that several hundred of them can be placed in a thimble or a teaspoon! Their chief uses are in the moving parts of gyro compasses, timing devices and instruments of accuracy. They are made under powerful magnifying lenses and their manufacture is not referred to as precision work but as "high" precision work. In these bearings, balls of 1/32" are in common and extensive use and balls of lesser diameter are in occasional use for especially delicate applications.

In Part II of *Bearings for Victory* in June MECHANIX ILLUSTRATED, we shall learn how bearings are manufactured and the precision tests they must pass before they are OK'd for the nation's industry.

Sodium is one of the eight commonest elements in the earth's crust.

Ideas For Service Men

[*Continued from page 93*]

Deutsch of Brooklyn, N. Y. All they have to do is fasten the matches to the cigarette pack by means of a strip of adhesive tape placed under the rows of matches and around the pack. Since there are exactly 20 matches in the average pack (count 'em) and also 20 cigarettes, the whole thing works out perfectly.

PARATROOPERS, AMPHIBIAN ENGINEERS, etc. will find the following suggestion, submitted by Cpl. Robert W. Needy of Camp Gordon Johnston, very useful. Men wearing boots with rawhide thong lacings can simplify the job of pushing the end of the lace through the eyes in the boot by simply baking the oil out of the lace for about one-half inch from the tip, using a match or other flame. After the lace cools trim to a point with a pocket knife. You will find it as hard and good as a metal tip.

JACK FRIED of Camp Shanks, Orangeberg, N. Y. is a watchmaker, and has a few suggestions for the care and feeding of that all-important member of the Service Man's equipment—his wrist watch. (See drawing.)

(1) If you lose or break the crystal and a new one is not immediately available, place a piece of cellophane under the frame of the watch and snap it shut. This will protect it from dust and moisture and will not interfere with the movement of the hands.

(2) Wear your watch on the inside of your wrist, crown facing your palm. This will lessen the danger of breakage of crown, stem and crystal, especially when crawling. It also helps keep perspiration out of the stem.

(3) When going through maneuvers in water, sand or mud remove the watch, place in a rubber finger, pack in a cigarette box and keep it in your shirt pocket. (Mr. Fried says he's found sand and rust in at least 50% of the *waterproof* watches he's opened.)

(4) When a wrench is not available to remove the back of a waterproof watch the job can be done as follows: Melt some sealing wax on the case and place a flat piece of narrow metal in the wax while soft. Wait 5 minutes for hardening, then unscrew the back.

(5) To dust proof the case or seal the crystal run clean nail polish along the cracks, being careful not to get any in the stem.

(6) A drop of oil inside the pins that hold your strap will prevent rust and preserve them. When changing straps save the old metal buckles, as none are made any more. Cloth straps are preferable to leather ones as they wear longer and do not stiffen from perspiration.

The St. Lawrence waterway is now 14 feet deep and handles 9,000,000 tons of traffic; if deepened to 27 feet with necessary lengthening of the canal locks, it would have 25,000,000 tons traffic capacity.

"Always Ready FOR ANY TEST"

HERE'S another typical letter from our far-flung battle fronts:

"In the past six months I've been riding Harley-Davidsons somewhere in North Africa. Have ridden other makes but none take the punishment that the Harley-Davidson has taken. I usually put about 200 miles a day on my motorcycle—so you can see I know what I'm talking about. She is ever faithful, always ready for any test."

That's the story of Harley-Davidson stamina and dependability in a nutshell. BUY WAR BONDS NOW—get set for your new Harley-Davidson as soon as the "fracas" is over—and the days come again for the fun and thrills of hillclimbs, endurance runs, race meets, gypsy tours and other exciting motorcycling events!

Lawn, Garden Equipment

[*Continued from page* 111]

can leak out result, heat a quart of tar and pour it inside the roller, turning slowly and tilting endways so that every crack is sealed.

The handle for this roller is made of two scroll-sawed yokes bolted to a wooden bar, with a cross-piece at the end, as shown. Bearings consists of short lengths of tubing, brass preferred, or if not available, ½" pipe reamed for the lag screw spindle.

Fig. 2 shows another type of roller made from a number of flat wooden disks, the centers of which have been scroll-sawed out, glued together. End disks are bored for a 1¼" wooden axle and the unit turned on a lathe. Note that the disks alternate with grain at right angles, making a strong structure. The handle-bar consists of two steam-bent spruce or hickory members with cross-pieces located as shown. The bearing is similar to that of Fig. 1, and both should have an oil well filled with cotton, as illustrated in the sectional view.

Wheel Cultivator

This cultivator, with three different heads, will improve the quality of your Victory Garden and greatly lessen the work with hoe and spade. It is well braced and rigid without undue weight.

Build the framework of common ¾" (net) pine or similar material, assembling with screws throughout. The large-diameter wheel makes for easy handling between rows and is built up of rim segments with filler blocks between the spokes. Stagger the joints of the sidewall segments, and apply casein glue to all contacting surfaces. Spokes are secured to the hub with four screws in each side for the eight spokes. Install a short piece of pipe for the hub bushing to take a ½" bolt and drill and oil hole.

The important features of this piece of equipment are the heads or tools, plow share, trenching tool and cultivator. The plow share is made of hardwood with a concave face, and can be covered with sheet metal on the front or working surface, bringing the edges over the wood and securing with screws. Hardwood is also used for the trenching tool, and this, too, should be sheathed with metal. Of course, if you don't mind making replacements every other season the plain hardwood will serve well. Our forefathers plowed with wood and seemed to be pretty fair farmers.

Cultivating plant rows is most important, and this tool does the job easily and efficiently. It requires some square bar wrought iron, usually obtainable at a scrap yard.

India is increasingly important as a source of precious stones for the American trade.

A WPA survey in Ohio has located 7,200 tons of abandoned street car rails, which can be salvaged for defense steel.

Lighten Those Shadows

[*Continued from page* 125]

stores. By loosening the wing nut, this crosspiece reflector support can be either raised or lowered to any point on the tripod stand.

The shade is lifted upward to open it for use, and to hold it in place, an extension arm should be fitted to the top of the rear leg of the stand. The arm can be made of a 3' to 4' length of ¾" wood fitted with a screw hook at one end and a screw eye at the other. A sheet-metal arm clamp with a bolt and wing-nut tightener can be attached to the top of the rear leg to clamp the extension arm in place, still permitting easy adjustment.

To use the outfit, slip the hook of the extension arm through the hole in the end of the window shade and raise it to the desired position. Then, for added rigidity, anchor the tail of the arm to the rear leg of the stand by means of a length of cord from the screw eye. This reflector can be adjusted to almost any tilt or height. One or two of these units will permit you to take full advantage of the brilliance of outdoor sunlight, and you can use them indoors, too, for reflecting artificial light and getting that soft, indirect lighting, thereby saving on bulbs and electric bills as well as improving greatly the quality of your pictures.

Electric Call Bell

[*Continued from page* 130]

rod, make it possible to slide the assembly into place, and small metal plates, one screwed to each side of the box support the rod after it is in the slots. This arrangement is necessary so that the can and its contents can be removed easily when it is necessary to change the battery. For the same reason the bottom of the box is held in place by screws instead of nails.

A guide of stiff wire with sharpened ends is hammered into the floor of the box. This guide keeps the cord on the drum and prevents it from slipping off the ends of the drum when the crank is turned. On the side of the box through which the crank protrudes a number of small holes are drilled. A peg in these holes prevents the crank from turning and reeling the cord off the drum. The peg is fastened to the side of the box by a string and screweye so that it cannot be lost. A leather strap passing through staples in the sides of the box provides a handle.

Any dry-cell batteries of suitable voltage will do for the circuit described. Should such batteries not be available, use the house current and a door-bell transformer. The easiest and most convenient place for the transformer is at a base plug in the bedroom

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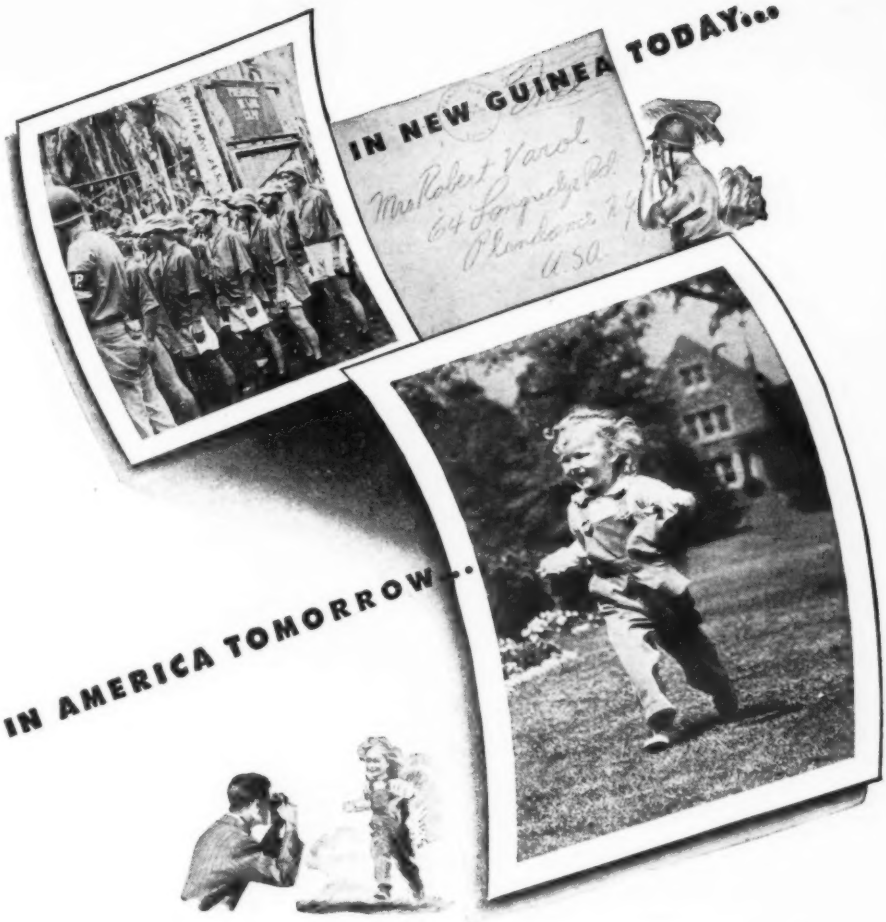
Designed for laying long-distance telephone cables underground, a plow-tram can dig a furrow and lay about three miles of double cable in a day.



THE BEST SUBJECTS OF ALL!

AND FINER THAN EVER CAMERAS!

That top one's a nice shot, soldier! It's good to know that you can find time, between cracks at the enemy, for those once-in-a-lifetime subjects. But what is better is knowing that a day is coming when *all* your shooting will be done with a camera. And when that day comes, you'll be taking *better* pictures than you've ever dreamed of. For while we're devoting 24 precious hours a day to the production of fine military optical instruments, we're using new skills, pioneering revolutionary new methods of attaining the highest precision in large-scale production. You can be sure that these achievements will bear fruit in a series of truly great cameras after the war. Expect your next camera to be a Universal!

UNIVERSAL CAMERA CORPORATION

NEW YORK • CHICAGO • HOLLYWOOD

Peacetime Manufacturers of Mercury, Cinémaster, Corsair Cameras and Photographic Equipment

WINGTIPS
by Abel Grasshopper

[AVIATION NEWS AND GOSSIP]

Due to the washing out of the War Training Service Program by the Civil Aeronautics Board, some hundreds of primary trainers of the personal plane variety will probably be available for private ownership. Like the good Marines "They've done their duty, and they're ready to do it again." Having established a fine performance record while in Air Corps use they can still give many hours of dependable flying. Until the day when you can get that post-war Aeronca, these jobs will help to "Keep you flying."

★ ★ ★

Take a twelve ton hammer...break a trip arm... and bang! goes a vital production schedule. Stir in some hectic phone calls to six different states...then start sweating at the promise of two weeks delivery. Add one resourceful pilot and Abel Grasshopper (an L-3 to you)...results ...just two days and nights...and back to work goes the big press. Another defeat for the Axis.

Such situations become incidents here at the home of "First and Finest."

★ ★ ★

"Ding How" say the clever Chinese when they wish to pay top tribute to man or deed..."Ding How" say we to Chinese pilot Captain Yuan Ho who recently visited Aeronca "and departing leaves behind him"...an aura of good English, good fellowship, and good flying.

There are so many trainees in our country from the land of the Chiang Kai-sheks, that Chinese pilots are no longer a novelty, but this descendant of the Mandarins is indeed a man among men. "Ding How" to Captain Yuan Ho, our nominee for Pilot of the Month.

"TRANSLATOR" John B. Kennedy
Famed News Commentator

Don't relax .... resourceful America is winning the War .... United America can win the Peace

Only light aircraft company to receive Army and Navy "E"

AERONCA
FIRST Grasshopper FINEST
MIDDLETOWN, OHIO

The School Shop

[*Continued from page* 105]

equator falls at the tropics of cancer and capricorn which are called the *horse latitudes*, regions of calm air. At the equator, where the air rises, is another belt of calm air called the *doldrums*. Both the doldrums and the horse latitudes with their lack of wind were shunned by the old sailing vessels which needed that wind for their motive power.

In addition to the general circulation of the earth's atmosphere caused by the earth's rotation, there are many local circulations. The *monsoon* circulations, most pronounced in India, are caused by seasonal temperature and pressure differences between land and sea masses. In the winter the land is colder than the sea, and the air over it is cold and heavy and tends to flow out to sea; an *off-shore* wind. In the summer the reverse is true and a sea-breeze blows from sea to land. A similar daily situation exists along seacoasts. At night the land air is heavier and an off-shore wind results, while during the day the sea air is heavier and a sea-breeze occurs. Near mountains and valleys, air on a warm slope tends to become light and rises: a *valley wind*. At night it cools and flows down the slope: a *mountain wind*.

In flying near the crests of mountains and ridges, make sure to maintain sufficient vertical clearance when *crossing* the mountain or ridge *into the wind* or *upwind*. This is to avoid being caught in the downdraft and turbulence which exist on the downwind side. When landing at strange airports and fields, too, watch out for turbulence and gusts which exist on the downwind side of hangars, hills and other obstructions.

(In June MI: Aviation Lesson No. 16—*Weather Fronts and Storms.*)

Cabin In The Country

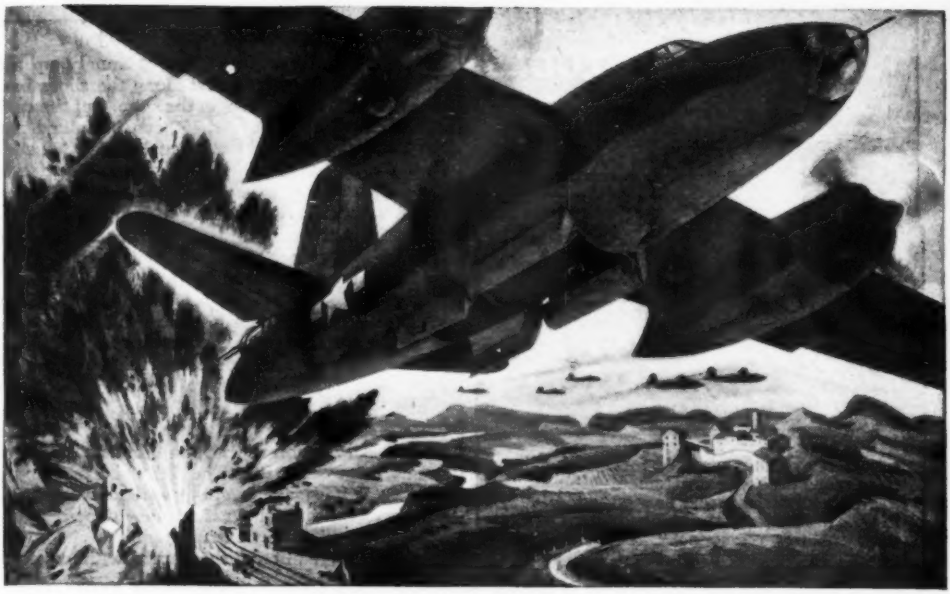
[*Continued from page* 96]

Fig. 7, shows the sliding windows, easily constructed by the novice. Another arrangement is to have the sash hinged at the bottom to swing in and held by a light chain, as shown in Fig. 5. Double-decker bunks are very simple, but it is wise to obtain the springs and mattresses first and design the bunks to fit. The dimensions given in Fig. 6 are for standard twin-bed springs. A closet with a curtain at the end of the bunk is a convenience and requires little space.

Tie beams across four or five of the rafters serve as floor joists for a little storage attic, but whether floored or not, these beams are absolutely necessary to prevent spreading of the walls.

Saplings form an attractive and useful arbor in the front of the house and give the owner a no-cost porch, Fig. 8. Cover them with berry-er grapevines.

A new liquid fuel is 60% coal and 40% oil, and produces a hotter fire than either coal or oil alone.



One More on the Nose!

A fighting flier wears his decorations on his chest. But a fighting plane wears *hers* on her nose.

And one look at the bombs and Swastikas painted on this B-26—"The Exterminator"—will tell you she's a two-fisted fightin' fool!

Like the notches on an old-time Injun-fighter's gun, they keep track of her score. A bomb for every one of her 40 successful missions . . . a Swastika for each of the six Nazi planes she's shot down.

"The Exterminator" fought her way through some of the war's hottest actions. She blasted Bizerte, Tunis, Sousse, Pantelleria, Sardinia, Naples and Rome. She "exterminated" the Germans' bridges, shattered their railroad yards, skip-bombed their ships. She pounded Salerno for a week to help pave the way for the 5th Army's landing.

Yet on all these flights, in all these fights, *not a man in her crew was scratched.* That's the kind of fighting record that makes bad reading in Berlin!

And that's the kind of team *you'll* be on when you fly with the A. A. F. . . . the hardest-hitting, best-trained team that ever took to the sky!

Bombardier, Navigator, Pilot, Gunner . . . whatever wings you wear . . . you'll hit the enemy often, and hit him hard. And you'll know how to get back home, so you can hit him again tomorrow.

And the Swastikas, or Rising Suns, painted on the nose of *your* plane, will be plenty of proof that you, too, are part of the "greatest team in the world!"

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Every Bombardier, every Navigator, every Pilot, every Gunner who wears A. A. F. wings, gets training unequalled by that of any air force in the world . . . training that makes him a better flier and a better fighter than the enemy he meets.

MEN OF 17. . .

You can get ready now for your place on the "greatest team in the world"—the A. A. F.—as Bombardier, Navigator, Pilot or Gunner. Go to the nearest Aviation Cadet Examining Board . . . see if you can qualify for the Air Corps Enlisted Reserve. If you qualify, you will receive the Enlisted Reserve insignia shown above . . . but will not be called for training until you are 18 or over.

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Prepare yourself in advance by taking C. A. P. Cadet Training as given by your local Civil Air Patrol. Also see your High School principal or adviser about recommended courses in the Air Service Division of the High School Victory Corps. Both afford valuable pre-aviation training.

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For information on Naval Aviation Cadet Training, apply at nearest Office of Naval Officer Procurement. This advertisement has the approval of the Joint Army Navy Personnel Board.

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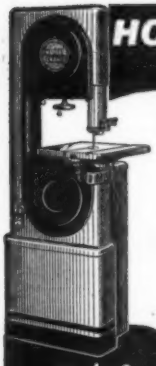

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Need a two inch micrometer? Illustrated is REED No. 802 with 1/10000" vernier. Price $6.30 plus 10c postage.

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SEND FOR OUR FOLDER "How Measure to 1/10000." YOURS FREE.

GEORGE SCHERR CO., Inc. 128 C Lafayette Street, New York, N. Y.

Cotton Kayak

[*Continued from page* 117]

about 15" centers. Next draw it snugly up the sides and stem, tacking first along the sheer battens at 1" intervals, then on the stem. Cut the ends of the cloth so that about ½" can be folded into the stem slot, which has been liberally slushed with marine glue. When the ends of the fabric are drawn as snugly as possible, drive the wedge block in over them, making a neat, water-tight seal, Fig. 5. In covering canoes or kayaks, this is the part that is the hardest to make water-tight by the old, conventional method.

If marine glue is not to be had in your locality, apply thick paint instead where the fabric contacts the parts mentioned above.

Separate pieces are used for the fore and aft deck skin. These are first tacked over frame C and E (but not to B and F) then to the top of the stem, and along the sheer batten, over the side fabric. Assuming that the fabric is drawn as snugly as possible, it can be tightened further by wetting it with a fine spray and allowing it to shrink, as cotton will. Or if airplane dope is available, that will make it drum tight.

When dry, paint all the fabric with a spray, which fills the pores better than a brush. Give a coat of some contrasting color inside the cockpit —before the coaming is installed. The latter should be finished in natural wood, after staining mahogany tone. Hardwood cutwater pieces are screwed to the stem and stern after painting. Holes should first be drilled through the wedge blocks in the slots to permit long screws passing through into the stem proper. Install half-round molding along the sheer and also chine. This will protect the fabric from chafing against a pier or other craft, and a hardwood keel prevents scraping the bottom.

Keep Your Cellar Dry

[*Continued from page* 97]

leader from which it can be discharged on lower ground as shown at *C* or into a stone-filled pit, called a dry well.

Drawings *D* and *E* illustrate a practical way of handling the water that is wasted from sill faucets. Any discarded container of suitable size such as a pan or machine casting may be sunk in the ground to serve as the drain basin. Set the basin so that it tilts slightly outward, thus directing the overflow away from the house and down into the slanting drain shaft of crushed stone.

In intensive attacks on the Japanese beetle, Connecticut's Agricultural Experiment Station is trying parasites, germs, and sprays.

Directed by Army engineers, WPA workers are making extensive maps of terrain for use in Army maneuvers.

INDIAN
TRAIL BLAZERS

Modern Indian Trails

Just off the highways of our nation, there are a million little tempting side roads that wind their way right into the heart of this great country of ours... modern "Indian Trails," teasing you to see what's at the other end. On an Indian you can "blaze" these trails easily, safely and comfortably.

One of the biggest thrills of "trail blazing" on an Indian is the feeling that you and your motorcycle are "one." Indians are alive with power. They give you a feeling of confidence and safety... respond easily to your slightest touch... and ride so smoothly you'll find it a pleasure to reel off the miles. Make your plans now so that when this war is over, you can enjoy motorcycling at its finest, in the saddle of an Indian.

INDIANS ON THE WARPATH

Right now, all new Indian Motorcycles go straight to war, and what a fighting record they're turning in! But new, improved, postwar Indians are already being blueprinted. *They're the motorcycles to wait for!*

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Read about Motocycling

Please send at once, a thrilling, action-packed FREE copy of *Indian News.*

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Keep It Rolling!

[*Continued from page* 115]

possibility, likewise a broken propeller shaft or trouble with the free wheeling unit.

IN THESE DAYS of frequent switching of tires from wheel to wheel it is more important than ever to check over the wheel nuts to make sure they are tight. Wheels should be jacked up when you do this (photo 4). If wheels are equipped with locking nuts these should occasionally be removed and cleaned. It's good insurance against rusting and difficulty taking them off when a tire change is needed.

TRIED EVERYTHING? That's what F. N. McK. said when he wrote me to tell about his failure to check the cause of an excessively lean mixture. But he exaggerated. He hadn't checked the intake manifold nuts. One of these was so loose air was sucking into the intake freely. (Photo 5.)

WORN RUBBER ENGINE MOUNTINGS get blamed for a lot of transmission trouble but we must not overlook the fact that wear on the shifter rails of the transmission still is the chief cause of gears jumping back to neutral. If your car has developed this trouble take off the gear cover (photo 6) and examine the rails as well as the detent (the gear locking ball or plunger).

FRONT COILS of knee action wheels often squeak if there is dirt and rust at their bases. This can be cured by squirting oil into the coil holders, but the job won't be a success unless coil tension is relieved by letting the hoisted car settle down a bit on a heavy wood beam braced between the ground and the center of the knee action unit. It's a job for a well-equipped filling station. (See photo 7).

AUTOMATIC OVERDRIVE is less mystifying when the gears are exposed to view, as the accompanying photo (8) shows. The unit attaches to the rear of the transmission and is something of a gear-within-gear proposition. Note the solenoid switch on the side which serves to cut the overdrive back to conventional whenever the driver is in overdrive and pushes the accelerator pedal to the floor.

HINT OF THE MONTH

When the engine starts easily with the car being pushed in gear, but is difficult to crank with the starter-motor, the chances are that there's weakness in the ignition coil. Cranking by pushing the car spares current which can then go to the coil to keep ignition up to normal for firing the cold mixture.

As much as one-third of the vitamin C in quick-frozen vegetables may be dissolved in the cooking water—which should not be thrown away.

Aluminum, nickel, and tin are among the elements that occur in the human body in small traces.

Eskimo Salad Set

[*Continued from page* 119]

to the bowl and putty the countersunk screw heads.

Apply two or three coats of ecru-colored brushing lacquer to the pieces, sanding lightly between coats and rubbing down the last with split 6-0 garnet paper and water. Use brushing lacquer for the decorations. Fingernail lacquer in small quantities can be used, also.

Prepare paper patterns of the decorations, black the backs with a soft pencil, and transfer to the work. The broader lines are painted most easily with $\frac{1}{16}$" and $\frac{1}{8}$" one-stroke sable lettering brushes. If such hand work seems too difficult, press decorator's tape in place and transfer the design to it. Cut out the stencil with a sharp knife. The lacquer then can be painted in without special care. After painting, strip off the tape. Draw the narrow black lines around the fishes and center panels of the fork and spoon with a pointed brush.

Tone the pieces by brushing on a coat of brown wiping stain. Allow it to dry sufficiently, as determined by test, and wipe off in irregular patches with a cloth. This treatment gives an antique effect and blends the colors, killing any raw appearance. The contrasts should not be abrupt or too pronounced. When thoroughly dry, the finish may be coated with clear lacquer to protect it from cleaning. A light pumice rubdown should be given to dull the gloss.

Inlay the beads to half-depth by boring for them, using small nails, preferably brass escutcheon pins, to hold them. If beads are unobtainable, make them from a white plastic crochet hook. Turn a wooden chuck and bore it to allow the hook to be forced in. While turning at high speed round the end with a fine file, and bore with a drill held in a small vise. Cut off the button with a hack saw. The half-balls are nailed on without inlaying.—*Edwin M. Love.*

$700.00 IN PRIZES

FOR YOUR BRIGHT IDEAS ABOUT WINDOW SHADES

TELL US WHAT IMPROVEMENTS YOU'D LIKE TO SEE MADE IN WINDOW SHADES AND VENETIAN BLINDS AFTER THE WAR

Is there anything about window shades that makes you mad? Something about Venetian Blinds that raises your blood pressure? *Fine!* That's just what CLOPAY wants to know . . . together with that bright idea for *getting around* your pet peeve.

The simplest suggestion may bring the postman to *your* door with that first prize of $200 in War Bonds or with one of the other 42 prizes. Maybe it's an idea for a new color or pattern, a new way of drawing shades or reversing them, or making them wear better. Or a suggestion that will make Venetian Blinds more attractive, more convenient, or easier to clean.

Remember, CLOPAY has become the world's largest maker of window shades because we've given people the kind of improvements people wanted. So *your* idea may be the very one we're looking for . . . the very one that will *win.*

GET BUSY . . . READ THESE EASY CONTEST RULES

1st Prize	$200 in War Bonds*
2nd Prize	$100 in War Bonds*
Next 10 Prizes	Each $25 in War Bonds*
Next 30 Prizes	Each $5 in War Stamps

1. Write a letter telling how you would improve window shades or Venetian blinds. Send as many entries as you wish.

2. Mail your entries to Clopay Corp., 1320 Clopay Square, Cincinnati 14, Ohio, before midnight July 15th, 1944.

3. Entries judged on the basis of clearness, interest, and originality. Decision of judges final.

Duplicate prizes awarded in case of ties. No entries returned. All entries, ideas and contents thereof, become the property of Clopay Corporation.

4. Contest open to any resident of the U. S. or Canada except employees of Clopay Corporation, its advertising agency and their families, and is subject to all Federal, state, and local laws and regulations.

*Maturity value

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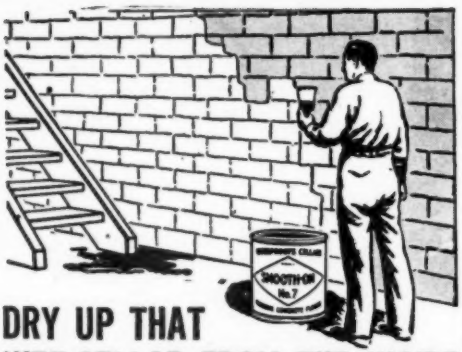
ON SALE AT 5-&-10c AND NEIGHBORHOOD STORES EVERYWHERE



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FREE SAMPLE and BOOKLET EXPLAINS ALL

WARNER ELECTRIC COMPANY
360 N. Michigan Ave., Chicago, Ill., Dept. 509

South Pacific Well

[*Continued from page* 120]

of galvanized pipe, a regulation Wisconsin air-cooled motor and a discarded truck winch. The latter was repaired and used to establish the gear ratio that serves to reduce the motor's speed and creates the power for the shaft and Pitman arm, which in turn drive the connecting rod suspended from a walking beam. The opposite end of the walking beam supports the 55' suction rod.

The winch reduces the motor's most efficient speed of 1,500 r.p.m. to 60 strokes per minute. It was badly damaged when found, but the inventor welded it in the mobile shop. He made the Pitman arm from scrap metal, also. The connecting rod was salvaged from an old coconut mill motor. Wickstrom fashioned the walking beam and its shackles from junk pile contributions and welding again did the rest.

The entire supporting frame is built of salvaged "I" beams and angle irons, cut and welded for rigidity. Sandbags weight it down in lieu of a concrete foundation.

Piecing together sections of concrete reinforcing rods, he made the long suction rod. The well head, a 6"x9" metal casing, and its water-tight seal through which the sucker rod operates, are also handmade from junk.

Most important, however, is the piston assembly at the lower extremity of the suction rod, entirely designed and made by the Gunnery Sergeant. His pride and joy, it is the "heart" of the device and comprises a piston, cylinder, and foot valve all machined from junk, as were the other components of cage, nipple, spacers, cones, nut and jam nut, valve and valve seat, and leather suction cups. The latter were tooled from an old rifle boot.

All parts of the 26"x3" cylinder were originally scrap metal and were machined into their working state for assembly into what the men now term "our gorgeous gadget."

Hobby Healing

[*Continued from page* 52]

A potter's wheel and kiln stand by for those who would do real pottery. A woodworking shop, complete with band saw, jig saw, drill press, and other power tools, stands next door, while next to that is the metal shop, complete with buffers, grinders metal working tools, and even a welding torch. Materials for the craftsworkers are supplied free by the Red Cross, much of it being salvage material collected for the purpose.

The Red Cross Workshop started in a small room as an experiment, worked out so well that it has grown to major proportions, occupying the basements of two buildings.

Government restrictions on installment buying have reduced the consumer debt by about one and a quarter billion dollars.

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And knowledge is also fun, when it helps you get more enjoyment from your shop, helps you turn out better-looking, more praiseworthy work. Every page of every issue of The Deltagram adds to your knowledge — and for just 50 cents a year, 8⅓¢ an issue!

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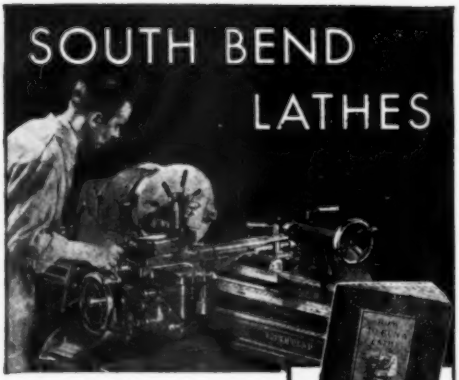

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DIC-A-DOO
PAINT BRUSH BATH
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BRUSH
BATH
5¢

Magnetic Current

[*Continued from page* 41]

had found its way into the watery acid. While the experimental set-up was such that nothing of the kind should occur the argument of "sneak currents" could have been advanced.

It was necessary, therefore, to repeat the experiment with a permanent magnet. It was done—and the result was the same. Naturally, since you never get anything for nothing, the energy required for decomposing the water had to come from somewhere. It could only come from the permanent magnet that had been used for the "magnetolysis." The magnet, then, should have weakened during the experiment. Professor Ehrenhaft found that it had—it had lost some 15 per cent of its previous strength.

Here again I remember the professor who lectured to us on physics some twenty years ago: "A permanent magnet will lose its strength very slowly over a period of many years, but while its strength can be increased up to a certain point there is no way of weakening it. You can demagnetize it by heating it to bright red. In doing that you change its internal structure and magnetism does not survive that change. But that is all that can be done."

Professor Ehrenhaft did weaken a permanent magnet. By making it do work in the form of a magnetolysis he drained it of some of its magnetism. Without assuming the existence of a magnetic current such a feat could not be explained at all. With that assumption the explanation is easy indeed: a permanent magnet is then the same in the realm of magnetism as a charged condenser is in the realm of electricity. Of course we probably will quickly come to the conclusion that the realms of magnetism and of electricity are not neighboring and interdependent realms at all, but merely different manifestations of the same thing.

This is how things stand at present.

Magnetism does produce three basic phenomena upon which the idea of an electric current is based. Consequently there is also a magnetic current. What is needed now is figures. That magnet lost some of its strength over a period of a number of hours. The professor is now waiting for an instrument, promised to him by a specialist for such instruments, which will permit measuring the loss of strength with great precision and continuously, while the loss is going on.

Now that the basic discovery has been made the real work is going to start, tedious and laborious research.

The discovery itself was, of course, not made on any specific day. It is the result of many years of growing suspicions and about four years of systematic search, most of it carried on in that one room at 485 Fifth Avenue. The work was done by the professor himself, assisted all through those four years by Mrs. Ehrenhaft, known in her own right as a sculptress under the name of Lilly

[*Continued on page* 146]

JOHNSON'S entire outboard production, of course, is for the armed services and essential needs. It's a two-way proposition. The armed services benefit from Johnson's twenty-two year experience in outboard manufacture. And Johnson benefits by "keeping its hand in" on the product for which it is famous.

When the war is won, we shall not merely pick up where we left off. We shall go on from where this new experience has taken us . . . Johnson Motors, Waukegan, Illinois.

DEALERSHIPS: Wherever you are located, if you are interested in sales AND SERVICE after the war, write us now.

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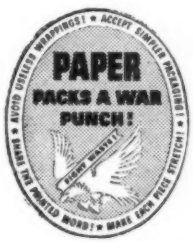
The war need for paper grows daily. Current paper production cannot meet this steadily mounting demand unless you and every other man and woman join Mrs. Jones *in using less paper* at the store, in your office, at home.


PAPER
PACKS A WAR PUNCH!
AVOID USELESS WRAPPINGS! • ACCEPT SIMPLER PACKAGING!
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This and other magazines, although using only 5 per cent of the paper supply, are saving 450 million pounds of paper this year—to release it for vital war needs.

This advertisement, contributed to the war effort by this magazine, was prepared by the War Advertising Council in cooperation with the War Production Board and the Office of War Information.

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Send Free Plan on Saw Filing business, no obligation

Name_____

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Magnetic Current

[*Continued from page* 144]

Rona. Later on somebody will probably write a romantic novel about these four years spent in search of the elusive magnetic current by the learned refugee, assisted by the deft fingers of his artist-wife whom he had met after the Nazis dislodged him from his home. The story sounds very much like a movie—two foreigners, the scientist and the artist, meeting in New York, getting married and setting out for new scientific horizons.

When still in Vienna, Dr. Ehrenhaft had been *Professor ordinarius* in the Department of Physics of the famous old Vienna University, succeeding Professor Stephan to the chair. Stephan's name is well known to electrical engineers as part of the name of the so-called Stephan-Bolsmann effect. Stephan was taught by Professor Lang who, in turn, had been a direct pupil of Michael Faraday. The line of basic discoveries begun by Faraday is now carried on by Ehrenhaft, the pupil of a Faraday pupil.

The suspicion of a magnetic current grew in Dr. Ehrenhaft's mind while he was still teaching in Vienna. He did not forget that his own teacher, Lang, had been doubtful about the fundamental difference between electricity and magnetism that was stressed in schoolbooks. He remembered always that Dr. Stephan had harbored some skeptical thoughts. He remembered too that Heinrich Hertz—discoverer of the Hertzian waves which form the basis of radio—had wondered whether electricity alone could furnish a full explanation. And, of course, Dr. Ehrenhaft himself had had many an opportunity to wonder about just this problem. But as long as the duties connected with the chair of physics at Vienna University kept him busy he did not have time or opportunity to go deeply into the matter. That had to wait until exile offered time to think and eventually, facilities with whom to work.

What facilities he had had in Vienna were lost. As a preliminary for such research as he later carried out in New York, Dr. Ehrenhaft had begun to build and assemble an enormous electro magnet. Unfortunately it was finished at about the time the Nazis marched into Vienna. One of the first things they did was to load that magnet on a railroad car bound for Berlin. I wonder whether they did anything with it or not. The latter would not be at all surprising. The first thing the Nazis did in Berlin was to confiscate half a dozen of the small experimental rocket motors of the German Rocket Society. I barely had time to snatch a scale drawing of them out of the files. In that case I know positively that they did not do anything with their loot.

But the loss suffered by Dr. Ehrenhaft proved to be a gain in the long run. Just because he did not have large-scale facilities to work with, the experiments made finally in New York, using a horseshoe magnet only five inches long, turned out to be much simpler than those in Vienna

probably would have been. As a matter of fact most of the experimental work is not at all complicated. The apparatus required could be set up by any reasonably skilled home craftsman who could lay his hands on a few lengths of soft Swedish iron, a few permanent magnets of various types, some distilled water, sulphuric acid, and a microscope.

It is only logical to ask about the practical value of this discovery. Of course it is not possible to prophesy, at this moment, that twenty years hence we'll have magnetic machinery doing this or that, and a General Magnetic Company to parallel the General Electric Company. At present the main problem is to find out what is a conductor for the magnetic current and what is an insulator. It is known that soft iron is a conductor, but apparently a very poor one. Steel, on the other hand, is an even poorer conductor, almost approaching the properties of an insulator. Nobody will be able to even think about magnetic machinery before he knows at least one *good* conductor and at least one definite insulator. When that problem is solved we may expect magnetic counterparts to electric apparatus.

But the discovery will be useful in another respect too. It can be expected to change the theory of electricity. Professor Ehrenhaft maintains, for example, that at present the mass of the electron is taken to be twenty times larger than it actually is. Whether this figure will be found correct by re-checks or not is comparatively unimportant; the point is that nobody ever looked for magnetic charges in the smallest particles of matter. The fact that there are magnetic charges will revolutionize many of concepts. Physicists will have to find out whether certain particles *always* carry magnetic charges in addition to their electric charges, or whether variations exist. If so, the picture might cloud considerably for awhile, with particles of practically no mass carrying an electric *or* a magnetic charge, or both an electric *and* a magnetic charge, and with particles of comparatively large mass (like neutrons and protons) doing the same thing. Light has been found to excite particles into having magnetic charges, another complication to be considered.

In the end, however, a new and vastly improved magnetic-electric (not "electro-magnetic" in the present meaning) theory will emerge. It will give us a better understanding of electrical machinery and, in consequence, produce better types and probably new types too. This improvement in the theory of electricity is the least that can result from the new conception. But one is justified in hoping for much more than this "minimum."

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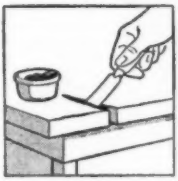

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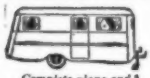

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Hornets Of Death

[*Continued from page* 48]

mounted on a single axis and the whole device placed on wheels. But these barrels were loaded laboriously, one at a time, there being no provision for simultaneous feeding. It wasn't until Dr. Gatling, an American, came upon the scene at about the time of the Civil War that the next big design step was taken. Gatling used multiple barrels which worked much like the chambers of a revolver. A hand crank kept them revolving and loaded them as they moved. This new weapon saw little action during the Civil War, but was used on several occasions in skirmishes with the Indians.

It remained for two other Americans, Browning (inventor of the BAR—the famous standard Browning automatic rifle) and Hiram F. Maxim, to develop the machine gun as we know it today. Maxim, better known, perhaps, for his Maxim silencer, was the first to work out a water-cooled, belt-fed weapon, during the first years of this century. The basic design principles of his gun are still being used, with little modification.

Basically, there are two types of machine guns. One is the gas-operated type, in which a part of the gases formed by the explosion is deflected into a separate chamber to operate a piston which ejects the spent cartridge. The other main type uses part of the gun's recoil motion to perform the same work. Both types are seeing wide service today, with all the warring armies.

Machine guns are used everywhere—aloft and afloat, as well as on land. In the air, a single well-aimed burst of fire from the multiple machine guns carried by a modern fighter plane can cut an enemy craft in two as though a giant buzz saw had rent it asunder. But it is ashore, as an aid to the foot-slogging infantrymen, that the machine gun finds its greatest application. In the old days, the fighting man depended on heavy body armor to deflect enemy weapons and missiles. Today the fighter assaults his enemy from behind the protective armor of thousands of lead and cupronickel bullets, spraying from all manner and form of machine guns.

Infantry firepower is aided by the light machine gun or machine rifle. Examples are on our own gas-operated .30 caliber Browning automatic rifle, the British Lewis and Bren, the German Madsen and the Jap Nambu, all of which have shoulder stocks and can be operated by one man for either full or semi-automatic fire (that is, the gun can be fired in long or short bursts without having to squeeze the trigger for each shot). Their cyclic or maximum rate of fire runs anywhere from 400 to 700 shots a minute.

The solid backbone of machine gun equipment in all armies is the heavy machine gun. In our army it is represented by the Browning M 1917, a .30 caliber, water-cooled, belt-fed, recoil-operated, tripod-mounted weapon with a weight of 35 pounds, minus tripod. The German model is a modified Maxim type which utilizes the force of

Hornets Of Death

the recoil for loading, firing and ejecting the empties.

While Britain and America neglected this weapon prior to World War I, the German army took it up with great gusto, buying manufacturing rights from Vickers-Maxim and producing a slightly heavier model, called the Spandau, in large quantities. The German entry into the war with some 50,000 Spandau-Maxims as against our own 1,200 heterogeneous models and the British paucity of only 200 guns, all told, considerably accelerated machine gun employment in all armies.

Today our allies, the British and the Russians, still use the Maxim type, water-cooled heavy gun. The Japs use a 1914 model gas-operated, Hotchkiss type, air-cooled and firing an 8 mm. bullet. In most armies today the elevation of the heavy machine gun is so devised as to be instantly changeable for anti-aircraft fire. In short, the machine gun today gives the foot soldier assault power on the offensive and protective power on both his horizontal and vertical flanks on the defensive.

Cycles Predict The Future

[*Continued from page 57*]

falling rapidly before a storm. This is far from unreasonable, however, and if five million people in your territory felt the same way you can imagine the effect on the business of clothiers, grocers and night clubs.

We live at the bottom of a sea of air whose pressure varies and is recorded as "highs" or "lows" on the weather map. Stratosphere flyers require oxygen masks because the pressure at high altitudes is so low they are starved for oxygen. Caisson workers, on the other hand, are subject to such high pressures that they are subject to a disease called the "bends." Rarely are we subject to such extremes, but every one of us, day to day, lives through similar changes of atmospheric pressure brought about by weather changes. A drop in barometric pressure of a single inch is practically equivalent to being whisked to an altitude 1,000 feet higher.

The general effect of sunspot cycles is to increase the world's warmth when spots are at a minimum, bring cold periods when they are at maximum. The past winter, unusually mild and lacking in snowfall—so mild that Russians called this unheard-of weather the "orphan's winter"—happens to confirm this dramatically. From last Christmas until January 22, there were no sunspots at all, a condition which has not occurred since the early 1930s (which, you will remember, was our Dust Bowl era)!

The relation of temperature to such seemingly unrelated phenomena as the reproductive cycle has been touched upon. But sunspots affect more

[*Continued on page 151*]

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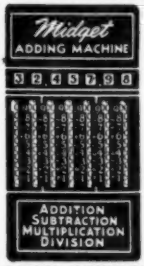

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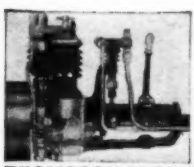

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Cycles Predict The Future

[*Continued from page* 149]

than temperatures. Dr. Harlan T. Stetson of the Massachusetts Institute of Technology has found that when sunspots are most in evidence there is more ultra-violet light received by the earth, less when sunspots are scarce. The relation of ultra-violet to vitamin formation in our bodies is well known. Less well understood is the affect of sunshine in ionizing (electrifying) the atmosphere.

Ions, which are atoms carrying an electrical charge, we take into our lungs with every breath. There are more ions present in the atmosphere at midday, when the sun is at its highest. Ultra-violet radiation, corresponding to sunspot cycles, may well affect the number of stimulating ions. That ions do affect our emotions and energies is well known, through the invention of such devices as the "electronic ionizer." This device, turned on to ionize the air in a living room, stimulates a party to a high peak of fun, but when it is turned off the guests become drowsy and go home.

Here is a probable mechanism of nature by which sunspots, or rather the radiation from the sun, turns our energies up or down in a cyclical pattern which may be reflected in eagerness to speculate, or to stuff our marginal funds cautiously into the old sock.

Solar radiation not only affects us, but controls the growth of plants and their variation in such things as vitamin content. The foods we eat for energy are thus subject to sun cycles which affect us indirectly. Indeed, all energy for all life on earth depends upon the sun—a variable star with cycles of its own charted by such authorities as Dr. Charles G. Abbot of the Smithsonian Institution—and thus there is a wholly logical basis for cyclical expressions of human energy.

The findings which have been presented (they are a very few of those which might have been mentioned) are preliminary to a consideration of cycles of immense practical importance to you, which might seem to be effects without causes were not some of the continuing influences upon you and your environment understood.

No scientist yet professes to have the final answers, but in the words of Dr. Huntington it is probable that "weather cycles affect health, health affects mental attitudes, and mental attitudes affect business."

Just what some of these effects are, and their habit of repeating themselves in cycles so that future events can be predicted, will be considered in future issues of MECHANIX ILLUSTRATED.

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Jungle Photography

[*Continued from page 45*]

splashing in the river continued, I checked and re-checked distances, aperture, speed of shutter, everything. Devotedly, fervently, I prayed that during the next quarter of an hour or so no stray cloud would blot out the sun.

A quarter of an hour? I barely had time to pick the best place to stand when the splashings abruptly ended. A few more seconds, and the vegetation before me parted silently. Something glided out of it, then stopped. It was the okapi. His throat was exactly the same silverish color as the *mandulu* leaves on which the sun was beating. His head, his great ears were almost indistinguishable from the big spearlike *matungulu* branches unkissed by light.

Before I was able to take in the fact that the pygmies were acting exactly as I had asked them, I had already snapped half a dozen pictures. Not one of the hunters had appeared. My eyes and ears couldn't even discover where they were hidden. But the okapi knew that they were all behind him. And it didn't take him long to realize that I was the one human being barring his path.

His big blue eyes took on that glassy, sinister expression which the natives fear so intensely. His teeth ground with irritation. His ears flipped backward with cold determination. Then he lunged straight toward me. Frantically, I snapped as many more pictures as I could. Then, when the animal was almost upon me, I jumped aside. But it was of no avail. There was a mighty crash. I saw stars and comets and bursting planets. While a ball of fire burned through my chest, I flew across space, light as air—until I crashed clear through a thick brush. A hammering of hoofs died in the distance. Cries arose all around me. Little brown hands reached for me, delicately moved me out, tenderly lifted me to my feet.

Then the chief emerged from another bush and rushed toward me, religiously carrying the camera, luckily intact, which I had instinctively thrown away just before the formidable bone plate of the okapi's forehead could smash it—and my chest.

And so, finally, were secured the photographs for which my friends the editors and publishers had clamored.

And, last but not least, so I secured the three broken ribs which today still persist in painfully forewarning me of any change in the weather. A barometer far more reliable than all the precision instruments with which I had to contend before obtaining a decent okapi picture.

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The Can-Do Boys

[*Continued from page 37*]

Battalions. The average age in some battalions is 35.

Lieutenant Commander Allen Carmichael reports the case of Chief Bernard Vinck, stationed at Tulagi. Chief Vinck pondered on the frustrated desire of the non-elect for Naval Academy rings worn only by graduates of Annapolis. The massive, jewel-studded gold bands aroused the envy of those not permitted to wear them.

"To amuse himself during his free hours, Chief Vinck rigged up his tent into a pawnshop complete with three cocoanuts hanging over its door," said Commander Carmichael. "With this done, he had to have something for his shelves, so he conceived the Tulagi Academy ring. He was an expert at handling metals and soon hammered some Jap aluminum and the 'cat-eye' of a snail into an attractive ring. The demand was immediate, and he soon had more orders than he could fill.

"Business began to boom so much that he changed the pawnshop's name to 'Vinck & Vinck, Inc.' because that sounded more impressive, and upped his prices. But the demand continued until competitors entered the field. When I left, the Academy rings were selling for $13 each.

"Chief Vinck explained his price in this way: $2 for material, $3 for government tools used, $5 for spectators' time, $1 for his own labor, and $2 for labor costs brought on by the fact of competition entering the field."

That last item sounds pretty sinister. Wonder if the chief uses henchmen to "discourage" rival artists?

Anyway, when questioned by admirers, Seabees explain with elaborate nonchalance that they are Tulagi Academy rings.

Such versatility among the Seabees is not at all unusual, because all of them are specialists in one or more trades, and many have ten to twenty years of experience behind them. The Construction Battalions, now at full length, number among their complement of 262,000, men of fifty-nine different skills and trades, including blacksmiths, bulldozer operators, dredge deckhands, quarry drillers, electricians, engine operators, excavation foremen, gas and diesel engine repairmen, mechanics and oilers, pipelayers, riggers, sheet metal workers, telephone men, truck drivers, welders, barbers, cooks, divers, draftsmen, and many others. Each trade is represented in every battalion of 1,081 enlisted men and 33 officers. With the technical engineering knowledge contributed by the officers, all of the Navy's Civil Engineer Corps, it is no wonder that the Seabees haven't yet come up against a problem they couldn't handle. Yet the Seabees are a very young branch of the Navy's Bureau of Yards and Docks: they celebrated their second birthday last December 28th.

The need for workers who could fight was

demonstrated in the disastrous days of Wake, Guam, and Pearl Harbor.

Ingenuity also saves effort. A Seabee chief on a South Pacific island was given orders to move two 32-foot water towers to a hillside and there set them up. Because the streets through which the towers would have to pass had a clearance under telephone wires of only fifteen feet, the Chief was ordered to disassemble the tanks, carry them piecemeal through the streets, and reassemble them on the hillside. But to the chief's practical mind, this seemed like unnecessary work. Waiting until dark, he gathered together a dozen skilled electricians and had the tanks put upon two low bed trailers. Then, with a half-dozen wire cutters on the fore end of the first trailer, and the other half-dozen equipped with splicers on the aft end of the second trailer, the procession set out through the sleeping town. The tanks were in place on the hillside by dawn. No one bothered headquarters with the information that there had been a slight divergence from the method of operations contemplated by the orders. But telephone subscribers don't know yet why they kept getting wrong numbers the next day.

Like all soldiers and sailors, Seabees don't like to use their legs more than absolutely necessary. They become adept at utilizing available forms of transportation. Down in the Caribbean, Benny Floyd, an ex-lightweight fighter from Medford, Oregon, was faced with the prospect of wading half a mile to shore from his ship under full pack. Heaving a deep sigh, he was just about to step off into the water and begin the long trek when a big native girl, a female Joe Louis, but taller, hove into view in front of him with a smile on her face as broad as the Potomac. Benny wasn't very good at the native language, but he caught on at once when the smiling giantess backed up in front of him and signalled him to climb on. So Benny and his pack rode ashore dry while his mates watched him enviously.

There's a dispute that rages endlessly among the Seabees as to whether the climate is worse in the Aleutians or in the South Pacific. The latter offers torrid, humid, enervating heat, malaria and dysentery, and ferocious mosquitoes, while the Aleutians are notorious for the Williwaws, wind storms which strike with terrifying suddenness and pile-driving force. One such storm struck while four Seabees were nailing asbestos roofing on a warehouse. It struck so hard and so suddenly that it tore a sheet of asbestos from the men's hands and carried it, with one of them on it, to a hillside 150 feet away. Picking himself up with only a bump on the head the man said, "I only wish it had blown me right back home to Montana." The Williwaw is just the thing to do it.

But despite the formidable obstacles, the Seabees have done their work with amazing speed and thoroughness not only in the South Pacific

[*Continued on page 156*]

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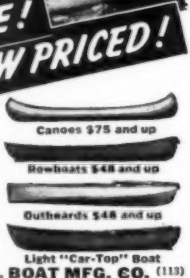

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The Can-Do Boys

[*Continued from page* 155]

and the Aleutians, but also in Newfoundland, the Caribbeans, Africa and Italy—wherever American forces are stationed.

Only recently, during the landings in Sicily, a Seabee detachment of the 54th Battalion saved the lives of more than 175 soldiers in a rescue that was as unique as it was dramatic. A Nazi bomb crashed down into an LST and set the heavily-laden troop and ammunition ship ablaze. On all sides of the ship, columns of water marked the spots where bombs and shells were landing. Planes roared overhead and dived to strafe the men on the ships. And on the ship, the flames were edging rapidly toward the boxes of ammunition.

Quick-witted Seabees on their own ship nearby sprang to the rescue. They pushed and pulled the pontoon causeway which they had already set up between their ship and the shore to the side of the blazing LST and held it there despite an intensified fury of enemy fire until the last soldier had raced across it to safety.

No wonder the Marine Corps commander leading the combined Marine-Seabee force that spearheaded the Allied attack on Bougainville sent over the loudspeaker system this message: "To the Seabees that go with us: We all are damn glad you are on our side!"

Hanson Baldwin, acute military commentator on the *New York Times*, said they are "the unsung heroes of the steam shovel and the monkey wrench—the men who build victory with sweat. "The Aleutian campaign was won by the Seabees and the men of their kind. . . . We won back Kiska and Attu as much with the pick and shovel, the monkey wrench and the grease gun, as we did with the bayonet and bomb."

The Marines have put it best:

"So when we reach the isle of Japan
With our caps at a jaunty tilt,
We will enter the city of Tokyo
On roads the Seabees built."

The generals and admirals have been unstinting in their praise, but it is words like these, from the men with whom they have worked, fought, and died, that the Seabees value most.

Interiors of land mines must be painted through a small hole in the end of the drum after the head has been welded on.

Egypt is four times as large as France, but only about one-thirtieth of the area is cultivated.

The world's shortest railroad is a 25-foot strip of track in Wyoming, used to teach Army drivers how to approach a crossing.

Some of America's wild silkworms spin silk of good quality, though coarser than China's famous worms produce.

Continent Of Tomorrow

[*Continued from page 64*]

produced in a small section, whereas 175 million square miles of the country are regarded as potentially suitable for good cotton.

Some clever traders have already turned the trick in Argentine dairy products, since the war started, and European cheeses were caught in the blockade. We used to import 50 million pounds of cheese from Europe. The importation of Argentine cheese to the United States in 1931, was less than one million pounds. Last year, we bought 10 million pounds from Argentina, and liked it. New and more capital, machines and men can boost those dairy products sky-high when peace comes.

Alfalfa is the pivot of the great beef industry. Although there are 14 million acres of alfalfa planted, with the crop harvested five or six times a year, yet there is not enough alfalfa to go around to feed the growing herds of cows, sheep and horses. They now number 150 million and will begin to multiply when the war is over.

Having made the circuit of the leading export industries of the country, we find ourselves back at the starting point of everything in Argentina, in Buenos Aires, the world's seventh largest city and the third largest community in the Western Hemisphere. Opportunities are just as thick here as is alfalfa on the Pampas, if you should happen to have a yen for commerce. There are two big current reasons why. The first lies in the circumstance that Argentina is limited industrially, due to the absence of native coal, together with only 60 per cent of her growing oil needs being supplied by national deposits of petroleum. Thus 75 per cent of manufactured articles must be imported. Even a great part of processed foodstuffs are brought into the country in a partially manufactured form. Secondly, a world shortage of manufactured articles, due to war demands, has long been acute.

The cost of living is high; whether you live in the center of the metropolis or in the heart of the wilderness. The current rate of exchange is four pesos to the American dollar. Wages for white collar workers run around $100 a month. Factory workers earn a minimum of $1.75 for an eight-hour day; both set by law. You'll have to pay about $100 a month for a suburban villa. Foodstuffs and furniture, due to importation, cost sometimes twice what you would have to pay for the same thing at home.

There is just one spoke missing in this wheel of prosperity. Here is where you and you and you; husky and intelligent, ambitious and hard-working Americans come in. That is, if you are technical men, mass-producers, one-man outfits who can do the work that ten men—no longer there—used to do.

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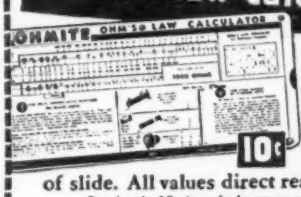

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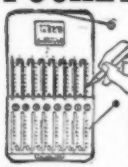

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